

UNIQUE STUDY POINT

AMITESH NAGAR, INDORE

CASE STUDY PRACTICE PAPER (2026-27)

CLASS X SCIENCE - CASE STUDY BASED QUESTIONS

Prepared by: SUMEET SAHU | Website : [Click Here](#) | WhatsApp Channel : [Click Here](#)

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Class : X

Subject : Science

Questions : 120

Marks per Question : 4

General Instructions :

- This question paper contains 120 case based questions divided into three sections A, B and C.
- Section A (Physics) has 44 case based questions, Section B (Chemistry) has 26 and Section C (Biology) has 50.
- Each question carries 4 marks. Every question has sub-parts, with an internal choice (OR) in the last sub-part.
- The marks for each sub-part are given in brackets at the end of the sub-part.
- All questions are compulsory. Use of a calculator is not permitted.

SECTION - A (PHYSICS)

This section consists of 44 case based questions of 4 marks each.

1. In our laboratories we use compound microscopes to see the magnified image of a microscopic object. A compound microscope is made up of two lenses. The lens nearest to the object to be viewed, called objective lens, forms real, inverted and magnified image of the object. This image serves as an object for the second lens called eyepiece. The eyepiece forms virtual, erect and magnified image of its object. Thus, the resultant image formed by a microscope is virtual, inverted and magnified with respect to the microscopic object viewed. **4**

- a. The image of an object formed by a convex lens of focal length 2 cm is real, inverted and magnified. What is the range of object distance in this case? (1)
- b. The image of an object formed by a convex lens of focal length 6 cm is virtual, erect and magnified. What is the range of object distance in this case? (1)
- c. i. An object is placed at a distance of 12 cm from the optical centre of a convex lens of focal length 18 cm. Draw a labelled ray diagram to show the formation of image in this case. (2)

OR

- ii. The image formed by a convex lens is real, inverted and of the same size as the object. If the distance between the objects and the image is 60 cm, determine the focal length of the lens. Give justification for your answer. (2)
2. A student took three concave mirrors of different focal lengths and performed the experiment to see the image formation by placing an object at different distances with these mirrors as shown in the following table. **4**

Case No.	Object-distance	Focal length
I	45 cm	20 cm
II	30 cm	15 cm
III	20 cm	30 cm

- i. List two properties of the image formed in Case I. (1)
- ii. In which one of the cases given in the table, the mirror will form real image of same and why? (1)
- iii. Name the type of mirror used by dentists. Give reason why do they use such type of mirrors. (2)

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OR

Look at the table and identify the situation (object distance and focal length) which resembles the situation in which concave mirrors are used as shaving mirrors? Draw a ray diagram to show the image formation in this case. (2)

3. The ability of a medium to refract light is expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. On comparing two media, the one with the large refractive index is optically denser medium than the other. The other medium with a lower refractive index is optically rarer. Also the speed of light through a given medium is inversely proportional to its optical density. **4**
- i. Determine the speed of light in diamond if the refractive index of diamond with respect to vacuum is 2.42. Speed of light in vacuum is 3×10^8 m/s. (1)
 - ii. Refractive indices of glass, water and carbon disulphide are 1.5, 1.33 and 1.62 respectively. If a ray of light is incident in these media at the same angle (say θ), then write the increasing order of the angle of refraction in these media. (1)
 - iii. The speed of light in glass is 2×10^8 m/s and in water is 2.25×10^8 m/s. (2)
 - a. Which one of the two is optically denser and why?
 - b. A ray of light is incident normally at the water-glass interface when it enters a thick glass container filled with water. What will happen to the path of the ray after entering the glass? Give reason.

OR

The absolute refractive indices of water and glass are $\frac{4}{3}$ and $\frac{3}{2}$ respectively. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (i) vacuum and (ii) water. (1)

4. A highly polished surface such as a mirror reflects most of the light falling on it. In our daily life we use two types of mirrors plane and spherical. The reflecting surface of a spherical mirrors may be curved inwards or outwards. In concave mirrors, reflection takes place from the inner surface, while in convex mirrors reflection takes place from the outer surface. **4**
- a. Define the principal axis of a concave mirror. (1)
 - b. A ray of light is incident on a concave mirror, parallel to its principal axis. If this ray after reflection from the mirror passes through the principal axis from a point at a distance of 10 cm from the pole of the mirror, find the radius of curvature of the mirror. (1)
 - c. An object is placed at a distance of 10 cm from the pole of a convex mirror of focal length 15 cm. Find the position of the image. (2)

OR

A mirror forms a virtual, erect and diminished image of an object. Identify the type of this mirror. Draw a ray diagram to show the image formation in this case. (2)

5. Study the data given below showing the focal length of three concave mirrors A, B and C and the respective distances of objects placed in front of the mirrors: **4**

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Case	Mirror	Focal Length (cm)	Object Distance (cm)
1	A	20	45
2	B	15	30
3	C	30	20

- i. In which one of the above cases the mirror will form a diminished image of the object? Justify your answer. (1)
- ii. List two properties of the image formed in case 2. (1)
- iii. What is the nature and size of the image formed by mirror C? Draw ray diagram to justify your answer. (2)

OR

An object is placed at a distance of 18 cm from the pole of a concave mirror of focal length 12 cm. Find the position of the image formed in this case. (2)

6. The refraction of light on going from one medium to another takes place according to two laws which are known as the laws of refraction of light. These laws are 1. The ratio of sine of the angle of incidence to the sine of the angle of refraction is always constant for the pair of media in contact. **4**

$\frac{\sin i}{\sin r} = \text{constant} = \mu$ This constant is called the refractive index of the second medium with respect to the first medium. The Refractive index is also defined as the ratio of the speed of light in a vacuum to the speed of light in the medium.

2. The incident ray, refracted ray and normal all lie in the same plane. This law is called Snell's law of refraction.

- i. When light travels from air to glass, which is greater the angle of incidence and the angle of refraction? (1)
- ii. What is the refractive index of the second medium with respect to the first medium, when the angle of incidence is 45° and the angle of refraction is 30° as light travels from air to the second medium? (1)
- iii. If the refractive index of glass is 1.5 and speed of light in air is 3×10^8 m/s. what is the speed of light in glass? (2)

OR

If the refractive index of material a with respect to material b is 2, what is the refractive index of material b with respect to material a? (2)

7. The relationship between the distance of the object from the lens (u), a distance of the image from the lens (v) and the focal length (f) of the lens is called the lens formula. It can be written as $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$. **4**

The size of the image formed by a lens depends on the position of the object from the lens. A lens of short focal length has more power whereas a lens of long focal length has less power. When the lens is convex, the power is positive and for the concave lens, the power is negative.

The magnification produced by a lens is the ratio of the height of the image to the height of the object as the size of the image relative to the object is given by linear magnification (m).

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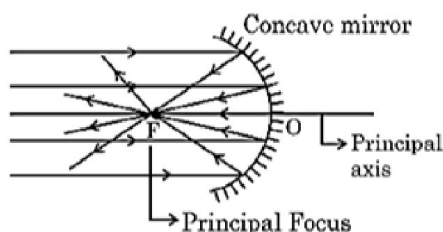
When m is negative, an image formed is real and when m is positive, an image formed is virtual. If $m < 1$, the size of the image is smaller than the object. If $m > 1$, the size of the image is larger than the object.

- An object with a height of 4 cm is positioned 10 cm away from a convex lens with a focal length of 20 cm. Determine the position of the image formed by the lens. (1)
- Given an object of height 4 cm positioned at a distance of 10 cm from a convex lens with a focal length of 20 cm, what is the height or size of the resulting image formed by the lens? (1)
- If a convex lens forms an image with a magnification of -2 and the height of the image is 6 cm, what is the height of the object? (2)

OR

What is the power of a concave lens with a focal length of 5 cm? (2)

8. Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as Principal Focus of the concave mirror. 4



- List two applications of concave mirror. (1)
- If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror. (1)
- Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror. (2)

OR

An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find: (2)

- focal length of the mirror, and
- magnification of the image formed with sign as per Cartesian sign convention.

9. Many optical instruments consist of a number of lenses. They are combined to increase the magnification and sharpness of the image. The net power (P) of the lenses placed in contact is given by the algebraic sum of the powers of the individual lenses $P_1, P_2, P_3 \dots$ as $P = P_1 + P_2 + P_3 \dots$ 4

This is also termed as the simple additive property of the power of lens, widely used to design lens systems of cameras, microscopes and telescopes. These lens systems can have a combination of convex lenses and also concave lenses.

- What is the nature (convergent/divergent) of the combination of a convex lens of power + 4D and a concave lens of power -2D? (1)
- Calculate the focal length of a lens of power 2.5 D. (1)

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- iii.** Draw a ray diagram to show the nature and position of an image formed by a convex lens of power + 0.1 D, when an object is placed at a distance of 20 cm from its optical centre. (2)

OR

How is a virtual image formed by a convex lens different from that formed by a concave lens? Under what conditions do a convex and a concave lens form virtual images? (2)

- 10.** The spreading of light by the air molecules is called the scattering of light. The light having the least wavelength scatters more. The sun appears red at sunrise and sunset, the appearance of the blue sky is due to the scattering of light. The colour of the scattered light depends on the size of the particles. The smaller the molecules in the atmosphere scatter smaller the wavelengths of light. The amount of scattering of light depends on the wavelength of light. When light from the sun enters the earth's atmosphere, it gets scattered by the dust particles and air molecules present in the atmosphere. The path of sunlight entering in the dark room through a fine hole is seen because of the scattering of the sunlight by the dust particles present in its path inside the room. **4**
- i.** Does the color of Earth appear different to an astronaut in a spaceship? (1)
- ii.** Why does the sky appear blue? (1)
- iii.** Why at sunrise or sunset, the sun appears to be reddish white? (2)

OR

Why is the red color selected for danger signal lights? (2)

- 11.** The students in a class took a thick sheet of cardboard and made a small hole in its centre. Sunlight was allowed to fall on this small hole and they obtained a narrow beam of white light. A glass prism was taken and this white light was allowed to fall on one of its faces. The prism was turned slowly until the light that comes out of the opposite face of the prism appeared on the nearby screen. They studied this beautiful band of light and concluded that it is a spectrum of white light. **4**
- i.** Give any one more instance in which this type of spectrum is observed. (1)
- ii.** What happens to white light in the above case? (1)
- iii. A.** List two conditions necessary to observe a rainbow. (2)

OR

- B.** Draw a ray diagram to show the formation of a rainbow. Mark on it, points (a), (b) and (c) as given below: (2)
- a.** Where dispersion of light occurs.
- b.** Where light gets reflected internally.
- c.** Where final refraction occurs.

- 12.** Atmospheric refraction is the phenomenon of bending of light on passing through earth's atmosphere. As we move above the surface of earth, density of air goes on decreasing. Local conditions like temperature etc. also affect the optical density of earth's atmosphere. On account of atmospheric refraction, stars seen appear higher than they actual are; advanced sunrise; delayed sunset, oval appearance of the sun at sunrise and sunset; stars twinkle, planets do not. **4**
- i.** How does atmospheric refraction affect the apparent length of the day? (1)
- ii.** Why does Sun appear slightly oval shaped at morning and evening? (1)
- iii.** Why do the stars twinkle but planets don't? (2)

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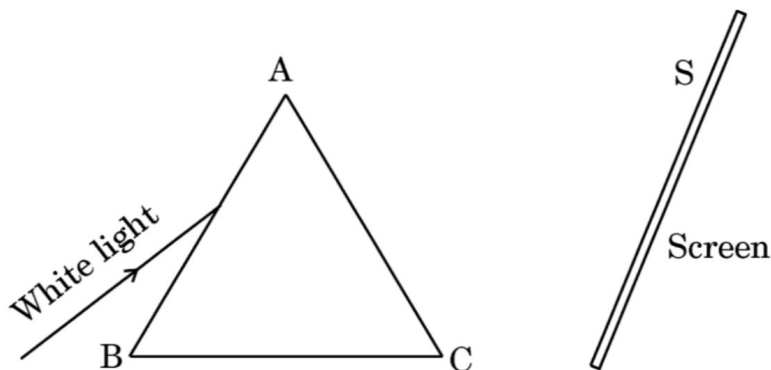
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OR

What color does the sky appear in the absence of an atmosphere? (2)

- 13.** A person allowed a narrow beam of white light from the sun to enter a dark room through a small aperture and placed a glass prism in its path in such a manner that the beam falls on the face AB of the prism as shown in the figure. **4**



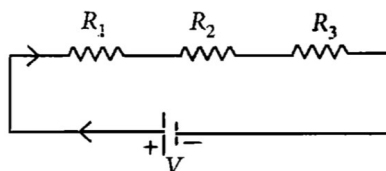
A screen S is placed on the other side of the prism, facing AC. On turning the prism slowly, a beautiful band of colours is obtained on the screen. It is the spectrum of sunlight.

- a. Name the phenomenon due to which a prism splits the incident white light into a band of colours. (1)
- b. State the reason of getting a band of seven colours in the above case. (1)
- c. i. Explain with the help of a labelled ray diagram, an experimental arrangement to show the recombination of the spectrum of white light. (2)

OR

- ii. Draw a labelled ray diagram to show the formation of a rainbow. (2)

- 14.** Two or more resistances are connected in series or in parallel or both, depending upon whether we want to increase or decrease the circuit resistance. **4**



The two or more resistances are said to be connected in series if the current flowing through each resistor is the same.

- i. When the three resistors each of resistance R ohm are connected in series then what will be the equivalent resistance? (1)
- ii. There is a wire of length 20 cm and having resistance $20\ \Omega$ cut into 4 equal pieces and then joined in series. What is equivalent resistance? (1)

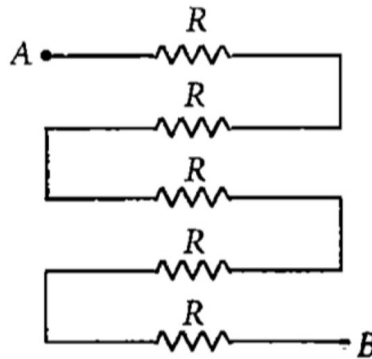
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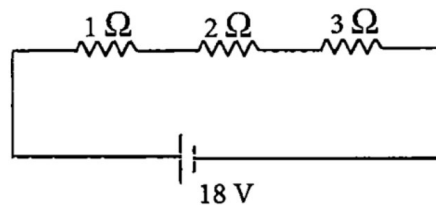
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- iii. In the following circuit, find the equivalent resistance between A and B ($R = 2\ \Omega$) (2)

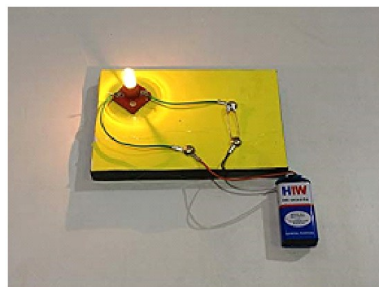


- In the given circuit, what is the current in each resistor? (2)



15. 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.

4



- 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? (1)
- ii. What is the SI unit of electric charge? It is equivalent to how many numbers of electrons? (1)
- iii. The electric current is expressed in which unit? Define the unit used to measure electric current. (2)

OR

If the amount of charge passing through the cell in 4 seconds is 12 C then find the current supplied by a cell. (2)

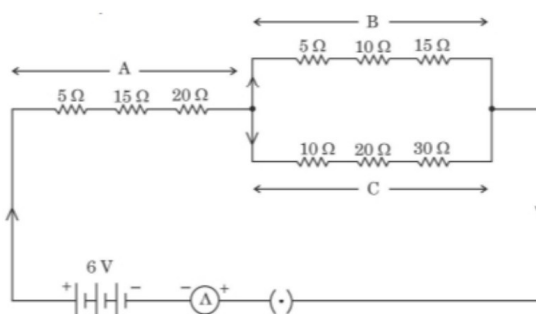
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- 16.** Study the following electric circuit in which the resistors are arranged in three arms A, B and C : **4**

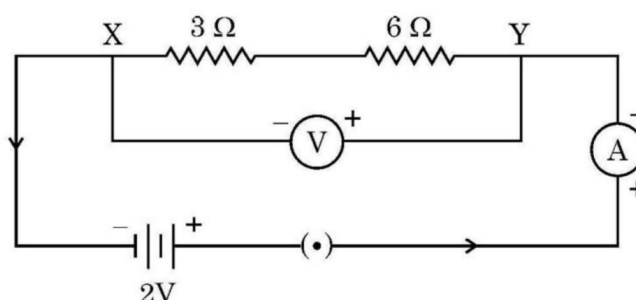


- i. Find the equivalent resistance of arm C. (1)
- ii. Calculate the equivalent resistance of the parallel combination of the arms B and C. (1)
- iii. Determine the current that flows through the ammeter. (2)

OR

Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit. (2)

- 17.** Study the circuit shown in which two resistors X and Y of resistances $3\ \Omega$ and $6\ \Omega$ respectively are joined in series with a battery of 2 V. **4**



- I. Draw a circuit diagram showing the above two resistors X and Y joined in parallel with same battery and same ammeter and voltmeter. (1)
- II. In which combination of resistors will the (i) potential difference across X and Y and (ii) current through X and Y, be the same? (1)
- III. a. Find the current drawn from the battery by the series combination of the two resistors (X and Y). (2)

OR

- b. Determine the equivalent resistance of the parallel combination of the two resistors (X and Y). (2)

- 18.** 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 3.6×10^6 joules of electrical energy. **4**

- 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)

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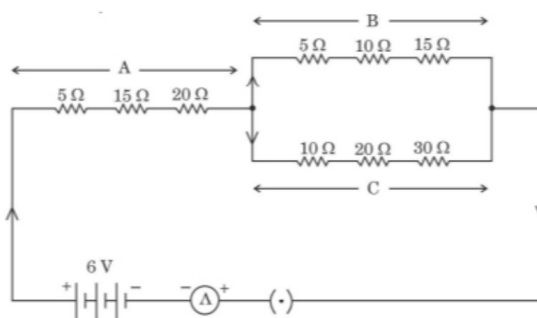
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- iii.** The electrical refrigerator rated 400 W operates 8 hours a day. The cost of electrical energy is Rs. 5 per kWh. Find the cost of running the refrigerator for one day. (2)

OR

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

- 19.** Study the following electric circuit in which the resistors are arranged in three arms A, B and C: **4**



- i.** Find the equivalent resistance of arm A. (1)
- ii.** Calculate the equivalent resistance of the parallel combination of the arms B and C. (1)
- iii.** Determine the current that flows through the ammeter. (2)

OR

Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit. (2)

- 20.** The heating effect of current is obtained by transformation of electrical energy into heat energy. Just as mechanical energy used to overcome friction is covered into heat, in the same way, electrical energy is converted into heat energy when an electric current flows through a resistance wire. The heat produced in a conductor, when a current flows through it is found to depend directly on (a) strength of current (b) resistance of the conductor (c) time for which the current flows. **4**

The mathematical expression is given by $H = I^2 R t$.

The electrical fuse, electrical heater, electric iron, electric geyser etc. all are based on the heating effect of current.

- i.** What are the properties of heating element? (1)
- ii.** What are the properties of electric fuse? (1)
- iii.** When the current is doubled in a heating device and time is halved, what will be the heat energy produced? (2)

OR

A fuse wire melts at 5 A. It is desired that the fuse wire of same material melt at 10 A. Find the new radius of the wire? (2)

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- 21.** We know that a battery or a cell is a source of electrical energy. The chemical reaction within the cell generates the potential difference between its two terminals that sets the electrons in motion to flow the current through a resistor or a system of resistors connected to the battery. To maintain the current, the source has to keep expanding its energy. Where does this energy go? A part of the source energy in maintaining the current may be consumed for useful work (like in rotating the blades of an electric fan). The rest of the source energy may be expended in heat to raise the temperature of the gadget. We often observe this in our everyday life. For example, an electric fan becomes warm if used continuously for a long time, etc. On the other hand, if the electric circuit is purely resistive, that is, a configuration of resistors only connected to a battery; the source energy continually gets dissipated entirely in the form of heat. This is known as the heating effect of electric current. This effect is utilized in devices such as an electric heater, electric iron, etc.

4



- i.** Explain Joule's heating law. (1)
- ii.** In practical situations, when an electric appliance is connected to a known voltage source, then how does the heating effect of electric current can be calculated? (1)
- iii.** Write the relation between heat energy produced in a conductor when a potential difference V is applied across its terminals and a current I flows through for t . (2)

OR

Two identical wires one of nichrome and the other of copper are connected in series and a current (I) is passed through them. State the change observed in the temperatures of the two wires. (2)

- 22.** When electric current flows in a purely resistive circuit electrical energy gets fully converted into heat energy. The amount of heat produced (H) in the circuit is found to be directly proportional to (i) the square of current I^2 (ii) the resistance (R) of the conductor and (iii) the time (t) for which current flows. In other words $H = I^2Rt$. Electrical devices such as an electric fuse, electric heater, electric iron etc. are all based on this effect called heating effect of electric current.

4

- a.** List two properties of heating elements. (1)
- b.** List two properties of electric fuse. (1)
- c.** Name the principle on which an electric fuse works. Explain how a fuse wire is capable of saving electrical appliances from getting damaged due to accidentally produced high currents. (2)

OR

The power of an electric heater is 1100 W. If the potential difference between the two terminals of the heater is 220 V, find the current flowing in the circuit. What will happen to an electric fuse of rating 5 A connected in this circuit? (2)

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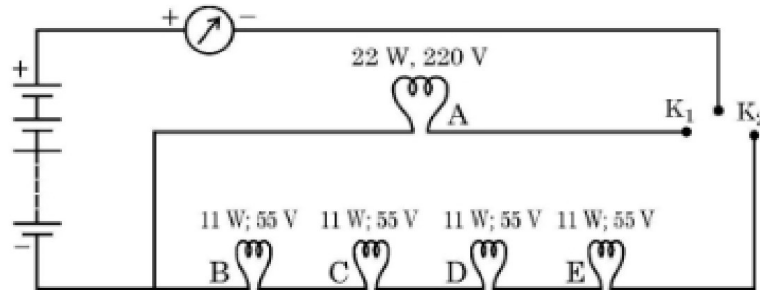
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- 23.** In a domestic circuit five LED bulbs are arranged as shown. The source voltage is 220 V and the power rating of each bulb is marked in the circuit diagram. Based on the following circuit diagram, answer the following questions:

4



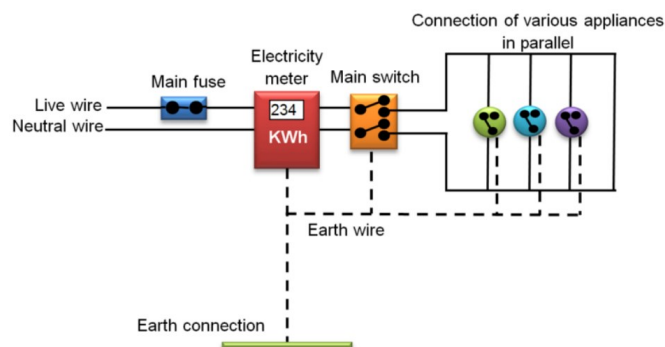
- a. State what happens when (1)
 - i. key K_1 is closed.
 - ii. key K_2 is closed.
- b. Find the current drawn by the bulb B when it glows. (1)
- c. Calculate
 - i. the resistance of bulb B, and
 - ii. total resistance of the combination of four bulbs B, C, D and E. (2)

OR

What would happen to the glow of all the bulbs in the circuit when keys K_1 and K_2 both are closed and the bulb C suddenly get fused? Give reason to justify your answer. (2)

- 24.** In our homes, either the overhead electric poles or underground cables support the power supply flowing through the mains supply. One of the wires in this supply is covered with insulation in the colour red, and another wire colored black. At the meter board, these wires pass into an electric meter through the main fuse. The main switch, live wire, and the neutral wire are in connection to the line wires in our homes; these wires then supply electricity to separate electric circuits within the house.

4



- i. What is the colour of the live wire? (1)
- ii. Where is the fuse placed in the electric supply in the above-given figure? (1)
- iii. What is the commercial unit of the power supply? (2)

OR

What is the role of the fuse in series with any electrical appliance in an electric circuit? (2)

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- 25.** As shown in the diagram, an electric circuit consisting of an ammeter, a voltmeter, 4 cells of 1.5 V each, a plug key with a gap XY was set up. Voltmeter and ammeter readings were recorded in the observation table for four arrangements as given below:

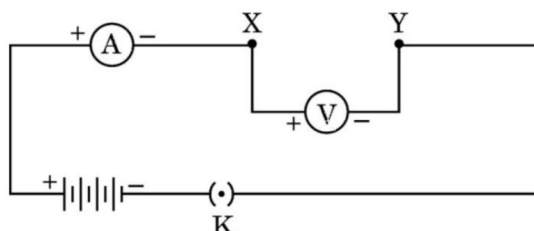
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Arrangement No. 1 - only resistor R_1 in gap XY

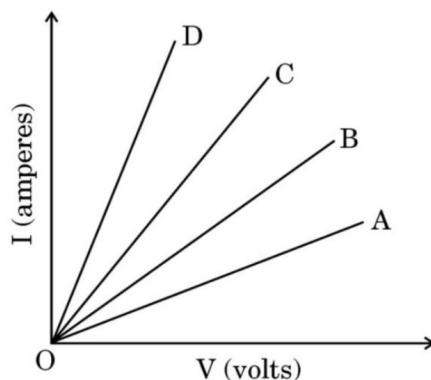
Arrangement No. 2 - only resistor R_2 in gap XY

Arrangement No. 3 - Resistors R_1 and R_2 in series in gap XY

Arrangement No. 4 - Resistors R_1 and R_2 in parallel in gap XY



Based on the observations, four V - I graphs A, B, C and D as shown in figure were drawn. Study these graphs.



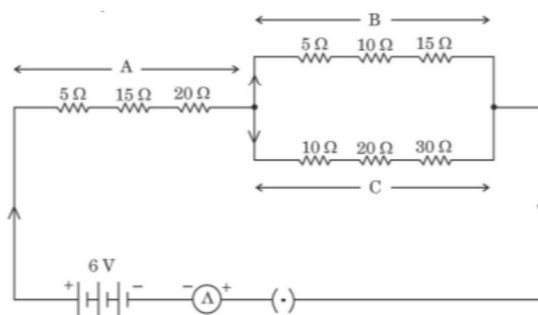
- a. Which one of the graphs represents the series combination of R_1 and R_2 ? (1)
- b. Which one of these graphs represents the parallel combination of R_1 and R_2 ? (1)
- c. i. Show an arrangement of three resistors, each of resistance $10\ \Omega$, so that the combination has a resistance of $15\ \Omega$. Give justification for your answer. (2)

OR

- ii. A battery of 6 V is connected with a series combination of five resistors of $0.1\ \Omega$, $0.2\ \Omega$, $0.3\ \Omega$, $0.4\ \Omega$ and $0.5\ \Omega$. How much current would flow through the $0.3\ \Omega$ resistor? Justify your answer. (2)

- 26.** Study the following electric circuit in which the resistors are arranged in three arms A, B and C:

4



- i. Find the equivalent resistance of arm B. (1)

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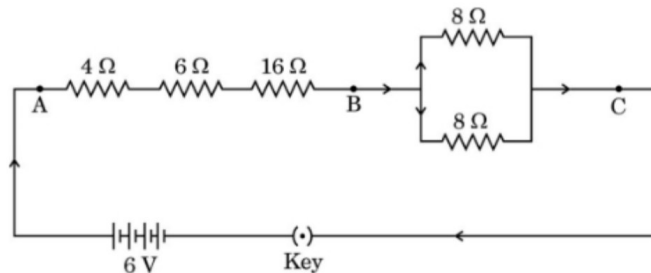
- ii. Calculate the equivalent resistance of the parallel combination of the arms B and C. (1)
- iii. Determine the current that flows through the ammeter. (2)

OR

Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit. (2)

27. Study the following circuit:

4



On the basis of this circuit, answer the following questions:

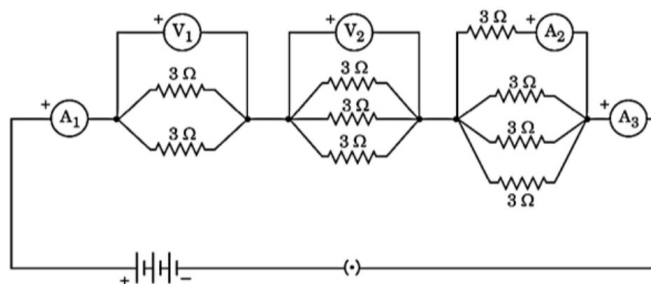
- a. Find the value of total resistance between the points A and B. (1)
- b. Find the resistance between the points B and C. (1)
- c. Calculate the current drawn from the battery, when the key is closed. (2)

OR

In the above circuit, the $16\ \Omega$ resistor or the parallel combination of two resistors of $8\ \Omega$ each, which one of the two will have more potential difference across its two ends? Justify your answer. (2)

28. Consider the following electrical circuit diagram in which nine identical resistors of $3\ \Omega$ each are connected as shown. If the reading of the ammeter A_1 is 1 ampere, answer the following questions:

4



- i. What is the relationship between the readings of A_1 and A_3 ? Give reasons for your answer. (1)
- ii. What is the relationship between the readings of A_2 and A_3 ? (1)
- iii. Determine the reading of the voltmeter V_1 . (2)

OR

Find the total resistance of the circuit. (2)

29. In 1827, a German physicist Georg Simon Ohm (1787-1854) found out the relationship between the current I , flowing in metallic wire and the potential difference across its terminals. He stated that the electric current flowing through a metallic wire is directly proportional to the potential difference V , across its ends provided its temperature remains the same.

4

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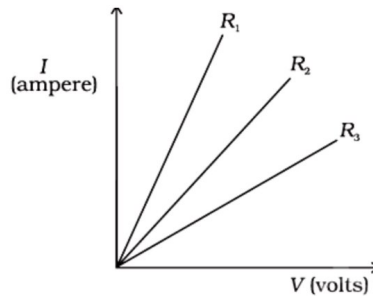
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The resistance of a circuit is defined as the ratio between the voltage applied to the current flowing through it. Rearranging the above relation, $R = \frac{V}{I}$

Electric charge flows easily through some materials than others. The electrical resistance measures how much the flow of this electric charge is restricted within the circuit.

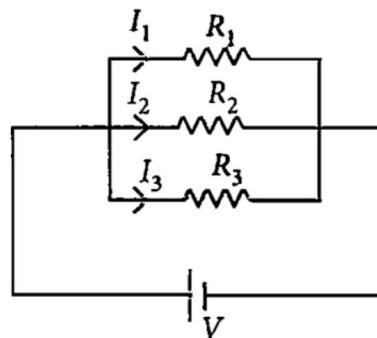


- i. What is the unit of electrical resistance? (1)
- ii. Define Ohm's law. (1)
- iii. From graph which resistance have high resistance? (2)

OR

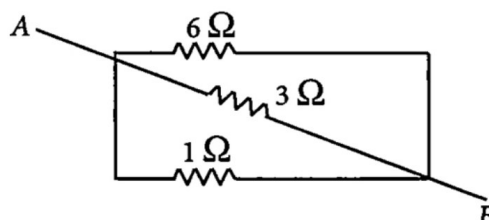
What does the slope of V-I graph at any point represent? (2)

- 30.** If two or more resistances are connected in such a way that the same potential difference gets applied to each of them, then they are said to be connected in parallel. **4**



The current flowing through the two resistances in parallel is, however, not the same. When we have two or more resistances joined in parallel to one another, then the same current gets additional paths to flow and the overall resistance decreases.

- i. Three resistances, 2 Ω , 6 Ω and 8 Ω are connected in parallel, then what will be the equivalent resistance? (1)
- ii. A wire of resistance 12 Ω is cut into three equal pieces and then twisted their ends together, then what will be the equivalent resistance? (1)
- iii. Three resistances are connected as shown. Calculate the equivalent resistance between A and B (2)



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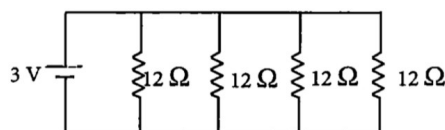
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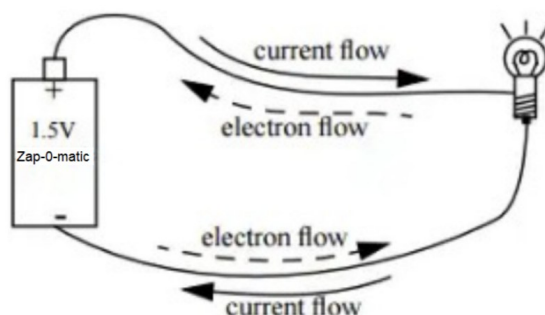
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OR

Find the current in each resistance. (2)



- 31.** The rate of flow of charge is called electric current. The SI unit of electric current is Ampere (A). The direction of flow of current is always opposite to the direction of flow of electrons in the current. **4**



The electric potential is defined as the amount of work done in bringing a unit- positive test charge from infinity to a point in the electric field. The amount of work done in bringing a unit positive test charge from one point to another point in an electric field is defined as potential difference.

$V_{AB} = V_B - V_A = \frac{W_{BA}}{q}$ The SI unit of potential and potential difference is volt.

- i.** Write the formula of voltage in terms of work done, current, time and charge.
- ii.** What is the number of electrons flowing per second in a conductor if 1 A current is passing through it?
- iii.** What would be the potential difference between the two terminals of a battery, if 100 joules of work is required to transfer 20 coulombs of charge from one terminal of the battery to other?

OR

The 2 C of charge is flowing through a conductor in 100 ms, then what would be the current in the circuit?

- 32.** A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern. **4**

- i.** What makes iron filings arrange in a definite pattern?
- ii.** Draw a diagram to show this pattern of iron filings.
- iii.** How is the direction of magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other?

OR

How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet.

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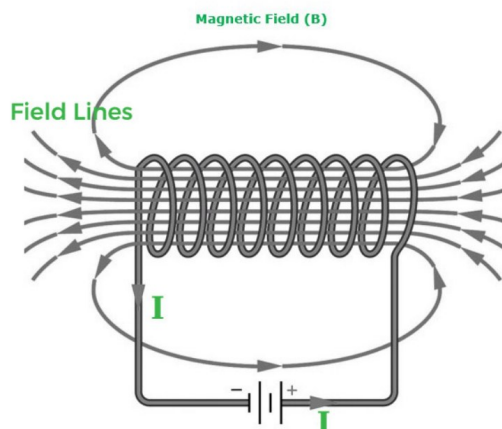
- 33.** A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern. **4**

- i.** What does this pattern of iron filings demonstrate? (1)
- ii.** Draw a diagram to show this pattern of iron filings. (1)
- iii.** How is the direction of the magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other? (2)

OR

How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet. (2)

- 34.** An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current-carrying solenoid can be used to magnetize a piece of a magnetic material like soft iron when placed inside the solenoid. The strength of the magnetic field produced by a current-carrying solenoid is directly proportional to the number of turns and strength of the current in the solenoid. **4**



- i.** What would be the strength of the magnetic field inside a long current-carrying straight solenoid? (1)
- ii.** Which end is north and which end is south pole when current flows through a solenoid? (1)
- iii.** A long solenoid carrying a current produces a magnetic field B along its axis. If the current is double and the number of turns per cm is halved, then what will be the new value of the magnetic field? (2)

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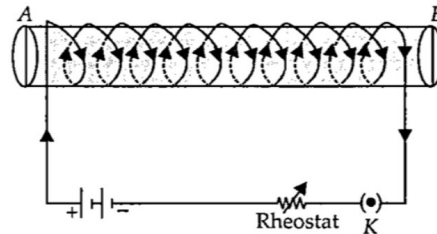
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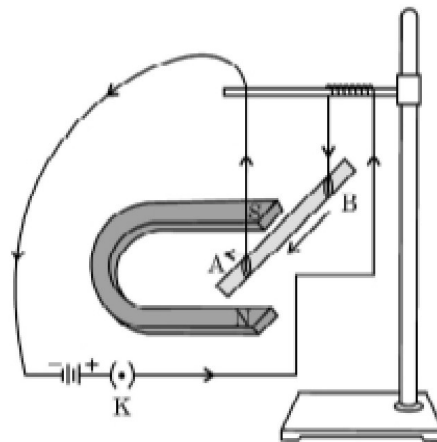
OR

A soft iron bar is enclosed by a coil of insulated copper wire as shown in the figure. When the plug of the key is closed, then where would the face B of the iron bar be marked? (2)



35. A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminum rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions:

4



- i. i. In the above experimented set up, when current is passed through the rod, it gets displaced towards the left. What will happen to the displacement if the polarity of the magnet and the direction of current both are reversed?
- ii. Name any two devices that use current carrying conductors and magnetic field. (1)
- ii. Why does the rod get displaced on passing a current through it? (1)
- iii. State the rule that determines the direction of the force on the conductor AB. (2)

OR

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor. (2)

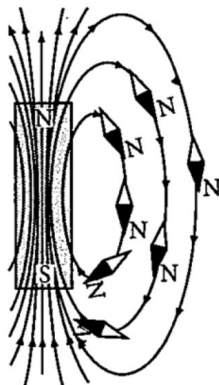
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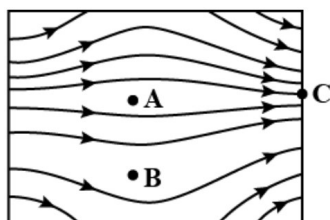
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- 36.** A magnetic field is described by drawing the magnetic field lines. When a small north magnetic pole is placed in the magnetic field created by a magnet, it will experience a force. And if the north pole is free, it will move under the influence of the magnetic field. The path traced by a north magnetic pole free to move under the influence of a magnetic field is called a magnetic field line. **4**



Since the direction of the magnetic field line is the direction of the force on a north pole, so the magnetic field lines always begin from the N-pole of a magnet and end on the S-pole of the magnet. Inside the magnet, however, the direction of magnetic field lines is from the S-pole of the magnet to the N-pole of the magnet. Thus, the magnetic field lines are closed curves. When a small compass is moved along a magnetic field line, the compass needle always sets itself along the line tangential to it. So, a line drawn from the south pole of the compass needle to its north pole indicates the direction of the magnetic field at that point.

- i.** The figure shows the magnetic field lines in a magnetic field. A, B., and C are three points in this field. At what point is the magnetic field strength? (1)



- ii.** Do the magnetic field lines intersect? if not why? (1)
iii. A strong bar magnet is placed vertically above a horizontal wooden board. What would be the magnetic lines of force? (2)

OR

Draw the pattern of magnetic field lines for a bar magnet. (2)

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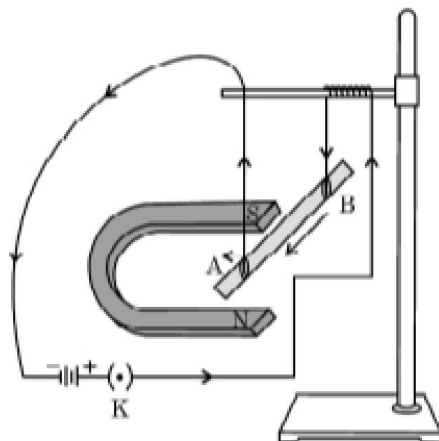
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- 37.** A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminum rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions :

4



- i. State the condition under which the displacement of the rod is largest for the same magnitude of current flowing through it. (1)
 - ii. State the rule that determines the direction of the force on the conductor AB. (1)
 - iii. i. If the U shaped magnet is held vertically and the aluminum rod is suspended horizontally with its end B towards due north, then on passing current through the rod from B to A as shown, in which direction will the rod be displaced?
 - ii. Name any two devices that use current carrying conductors and magnetic field. (2)
 - iv. Draw the pattern of magnetic field lines produced around a current-carrying straight conductor held vertically on horizontal cardboard. Indicate the direction of the field lines as well as the direction of the current flowing through the conductor. (2)
- 38.** A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt-sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern.
- i. Draw a diagram to show this pattern of iron filings. (1)
 - ii. Draw the magnetic field lines of a bar magnet showing the poles of the bar magnet as well as the direction of the magnetic field lines. (1)
 - iii. How is the direction of magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other? (2)

4

OR

How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet. (2)

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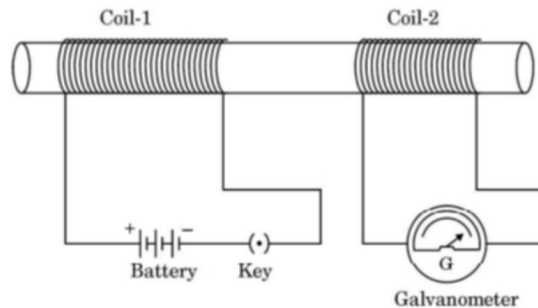
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- 39.** Take two different coils of copper wire having large number of turns, say 50 and 100 turns respectively. Insert them over a non-conducting roll as shown in the given figure. Connect the Coil-1, having large number of turns, in series with a battery and a plug key. Also connect the other Coil-2 with a galvanometer.

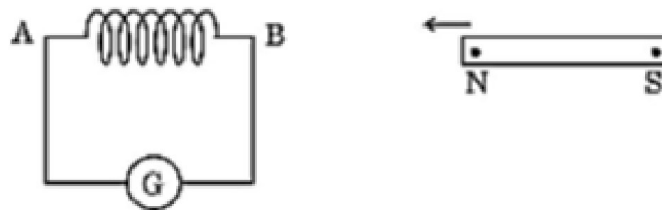
4



- i.** Explain the reason for the current which is responsible for the deflection in the galvanometer. (1)
- ii.** Define the phenomenon involved in this case. (1)
- iii.** State what is observed in the galvanometer, when (2) 1. the key is closed. 2. the key is opened.

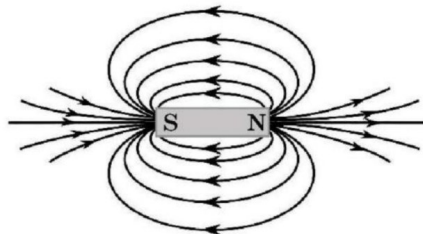
OR

A coil AB of copper wire is connected to a galvanometer as shown in the figure. What is observed when N-pole of a strong bar magnet is



- a.** pushed into the coil?
 - b.** held stationary inside the coil? State the reason for each observation. (2)
- 40.** In order to obtain magnetic field lines around a bar magnet, a student performed an experiment using a magnetic compass and a bar magnet. The magnet was placed on a sheet of white paper fixed on a drawing board. Using magnetic needle he obtained on the paper a pattern of magnetic field lines (as shown below) around the bar magnet.

4



- a.** By convention, the field lines emerge from north pole and merge at south pole. Why? Give reason. (1)
- b.** State the relationship between strength of the magnetic field and the degree of closeness of the field lines. (1)
- c. A.**
 - i.** No two field lines can ever intersect each other. Give reason. (1)
 - ii.** The magnetic field in a given region is uniform. Draw a diagram to represent it. (1)

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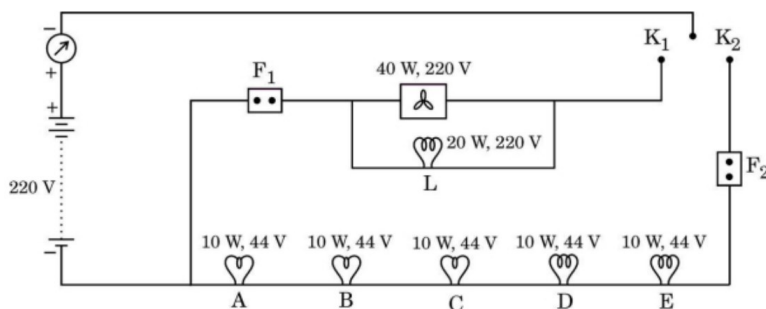
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OR

- B.** Draw the pattern of the magnetic field lines through and around a current carrying solenoid. What does the pattern of field lines inside the solenoid represent? (2)

- 41.** In a domestic circuit, six LED bulbs and a ceiling fan are arranged as per the circuit shown in the figure. The source voltage is 220 volts and the power rating of each device is marked in the circuit diagram. Two fuses F_1 and F_2 are also provided in the circuit. Based on the circuit diagram, answer the following questions :

4



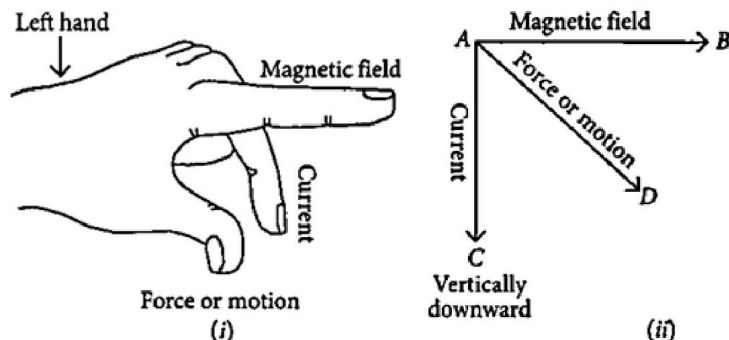
- a.** State what happens when (1)
i. only key K_1 is closed,
ii. and key K_2 is also closed.
b. Find the current drawn by the bulb L. (1)
c. i. Calculate the resistance of the bulb A. Find the total resistance offered by the circuit to the flow of current when only key K_2 is closed. (2)

OR

- ii.** What would happen to the glow of the bulbs in the circuit when K_1 and K_2 both are closed and the fuse F_1 melts suddenly? Give reason to justify your answer. (2)

- 42.** Andre Marie Ampere suggested that a magnet must exert an equal and opposite force on a current-carrying conductor, which was experimentally found to be true. But we know that current is due to charges in motion. Thus, it is clear that a charge moving in a magnetic field experience a force, except when it is moving in a direction parallel to it. If the direction of motion is perpendicular to the direction of magnetic field, the magnitude of force experienced depends on the charge, velocity (v), strength of magnetic field (B), and sine of the angle between v and B . Direction of magnetic force is given by Fleming's left-hand rule.

4



- i.** If an electron is travelling horizontally towards east. A magnetic field in vertically downward direction exerts a force on the electron along which direction? (1)
ii. A charged particle is moving with velocity v in a magnetic field of induction B . The force on the particle will be maximum when (1)

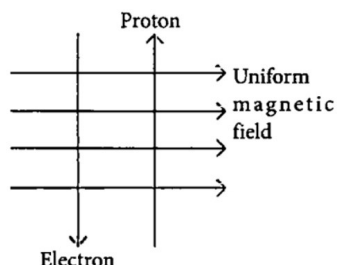
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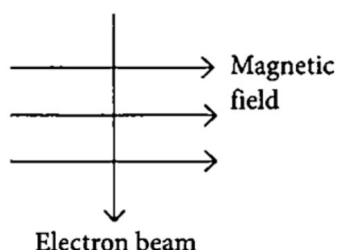
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- iii.** A uniform magnetic field exists in the plane of paper pointing from left to right as shown in figure. In the field, an electron and a proton move as shown. Where do the electron and the proton experience the force? (2)



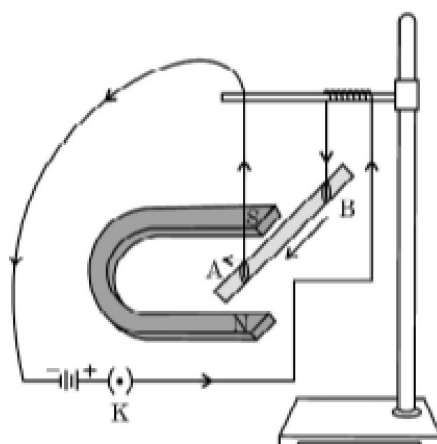
OR

An electron beam enters a magnetic field at right angles to it as shown in the figure. What would be the direction of force acting on the electron beam? (2)



- 43.** A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminum rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions:

4



- i.** Why does the rod get displaced on passing current through it? (1)
- ii.** State the rule that determines the direction of the force on the conductor AB. (1)
- iii. a.** If the U shaped magnet is held vertically and the aluminum rod is suspended horizontally with its end B towards due north, then on passing current through the rod from B to A as shown, in which direction will the rod be displaced?
- b.** Name any two devices that use current carrying conductors and magnetic field. (2)

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OR

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor. (2)

- 44.** In our homes, we receive the supply of electric power through a main supply also called mains, either supported through overhead electric poles or by underground cables. In our country the potential difference between the two wires (live wire and neutral wire) of this supply is 220 V. **4**
- a.** Write the colours of the insulation covers of the line wires through which supply comes to our homes. (1)
- b.** What should be the current rating of the electric circuit (220 V) so that an electric iron of 1 kW power rating can be operated? (1)
- c. i.** What is the function of the earth wire? State the advantage of the earth wire in domestic electric appliances such as electric iron. (2)

OR

- ii.** List two precautions to be taken to avoid electrical accidents. State how these precautions prevent possible damage to the circuit/appliance. (2)

SECTION - B (CHEMISTRY)

This section consists of 26 case based questions of 4 marks each.

- 45.** Redox reactions are those reactions in which oxidation and reduction occur simultaneously. A redox reaction is made up of two half reactions. In the first half reaction, oxidation takes place and in second half reaction, reduction occurs. Oxidation is a process in which a substance loses electrons and in reduction, a substance gains electrons. The substance which gains electrons is reduced and acts as an oxidising agent. On the other hand, a substance which loses electrons is oxidised and acts as a reducing agent. **4**
- i.** Illustrate where oxidation and reduction occurs together with an example? (1)
- ii.** What do you mean by oxidising agent and reducing agent? (1)
- iii.** For the given reaction, identify the oxidation and reduction parts. (2) $\text{ZnO} + \text{CO} \rightarrow \text{Zn} + \text{CO}_2$

OR

In the following reaction, which substance is reduced? (2) $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$

- 46.** When the fats and oil present in the food material get oxidized by the oxygen (of air), their oxidation products have unpleasant smells and tastes. Due to this taste of food material containing fats and oil change and become very unpleasant. The condition produced by aerial oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity. Rancidity spoils the food material prepared in the fats and oils which have been kept for a considerable time and makes them unfit for eating. **4**
- The development of rancidity in food can be prevented in the following ways-
- I. Rancidity can be prevented by adding an antioxidant to foods containing fats and oils.
- II. Rancidity can be prevented by packaging fat and oil-containing food in Nitrogen gas.
- III. Rancidity can be prevented by keeping food in a refrigerator.
- i.** What do you understand by oxidation? (1)
- ii.** How does the food become rancid? (1)

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iii. How can we prevent the rancidity of food? (2)

OR

Which type of food material gets spoiled by the phenomenon of rancidity? (2)

47. Those reactions in which two compounds react by an exchange of ions to form two new compounds are called double displacement reactions. A double displacement reaction usually occurs in solution and one of the products, being insoluble, precipitate out (separates as a solid). Any reaction in which an insoluble solid (called precipitate) is formed that separates from the solution is called a precipitation reaction. The reaction in which acid or acidic oxide reacts with base or basic oxide to form salt and water is called neutralisation reaction.

4

For example, $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$

- i.** When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. Mention the type of reaction. (1)
- ii.** Balance the following chemical reaction. (1) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) + \text{KNO}_3(\text{aq})$
- iii.** Barium chloride in reaction with ammonium sulphate forms barium sulphate and ammonium chloride. Which type of chemical reaction represents in this reaction? (2)

OR

Identify A in the following reaction. (2) $\text{AlCl}_3(\text{aq}) + 3\text{NH}_4\text{OH}(\text{aq}) \rightarrow \text{A} + 3\text{NH}_4\text{Cl}(\text{aq})$

48. When oxygen combines with other elements or compounds, the process is called oxidation the substances that combine with oxygen are said to have been oxidized.

4

The reduction is exactly the opposite of oxidation. If a substance loses oxygen during a reaction, it is said to be reduced. When hydrogen burns the hydrogen combines with oxygen to form water $2\text{H}_2 + \text{O}_2 = \text{H}_2\text{O}$ The hydrogen is oxidized in this reaction, but at the same time, the oxygen is reduced. Whatever oxidation occurs reduction must also occur.

- i.** Which chemical process is used for obtaining a metal from its oxide? (1)
- ii.** In the given reaction, which reactant species is oxidized? (1)
- iii.** In the given reaction, which reactant species is reduced? (2)

OR

If four molecules of Hydrogen are combined with oxygen then how many molecules of water are formed? (2)

49. When a more reactive element displaces a less reactive element from its compound, it is called a displacement reaction. The reaction is of two types. Single displacement reaction and double displacement reaction.

4

Iron being more reactive than copper displaces copper from an aqueous solution of copper sulphate. This is an example of a single displacement reaction.

On adding silver nitrate solution to sodium bromide, a yellow ppt of silver bromide and solution of sodium nitrate is formed. This is an example of a double displacement reaction.

- i.** When dil. sulphuric acid is added to pieces of iron sulphide, hydrogen sulphide gas is produced and soluble ferrous sulphate is formed. Which chemical reaction is involved in this process? (1)
- ii.** Mention reaction which is used for the preparation of oxygen gas in the laboratory. (1)

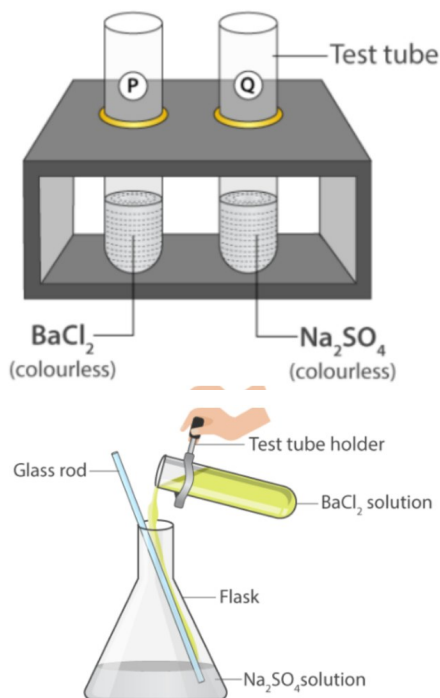
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- iii.** What are the products formed in the double displacement reaction discussed below?
(2)



OR

Which elements displace aluminum from its salt? (2)

- 50.** In a redox reaction, both oxidation, as well as reduction, takes place together, oxidation involves loss of electrons while reduction involves the gain of electrons. The redox-reaction may involve a combination of atoms and molecules, displacement of metals, or non-metals.

4

Example: $\text{CuSO}_4 + \text{Zn} \rightarrow \text{ZnSO}_4 + \text{Cu}$ displacement of Cu metal from its compound.

- i.** In the below equation, which gets reduced? (1) $\text{CuSO}_4 + \text{Zn} \rightarrow \text{ZnSO}_4 + \text{Cu}$
- ii.** The oxidising agent generally loses or gains an electron. (1)
- iii.** Identify the oxidising agent and reducing agent in the above reaction. (2) $\text{CuSO}_4 + \text{Zn} \rightarrow \text{ZnSO}_4 + \text{Cu}$

OR

Identify the type of given reaction. (2) $\text{CuSO}_4 + \text{Zn} \rightarrow \text{ZnSO}_4 + \text{Cu}$

- 51.** 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: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ The mass of reactants ($2 \times 24 + 32 = 80$) is equal to the mass of products [$2 \times (24 + 16) = 80$].

4

- 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. (1)
- ii.** The solid mercury (II) oxide is heated, and liquid mercury and oxygen gas are produced. Mention balanced chemical reaction. (1)
- iii.** Which laws are satisfied by a balanced chemical equation? (2)

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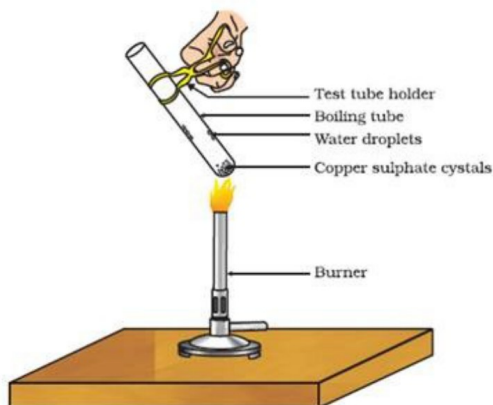
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OR

In the given chemical reaction, $(2) 2C_6H_6(l) + 15O_2(g) \rightarrow mCO_2(g) + nH_2O(l)$ Find the values of m and n respectively.

- 52.** Copper sulphate crystal contains water of crystallisation when the crystal is heated the water is removed and salt turns white. The crystal can be moistened again with water. The water of crystallisation is the fixed number of water molecules present in 1 formula unit of copper sulphate. On heating gypsum at 373K, it loses water molecules and became calcium sulphate hemihydrate.

4



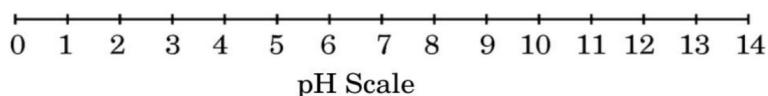
- i. If the crystal is moistened with water, then which colour of the crystal reappears?
- ii. What is the commercial name of calcium sulphate hemihydrate?
- iii. How many water molecules are present in one formula unit of copper sulphate?

OR

What is obtained when gypsum is heated at 373K?

- 53.** Acid-base indicators can be used to distinguish between an acid and a base. Universal indicator, a mixture of several indicators, shows different colours at different concentrations of acids and bases, thereby indicating their pH on the pH scale of 0 – 14. The pH of a solution is measured by pH paper, which is a paper impregnated with a universal indicator.

4



Answer the following questions:

- a. Solution P is a strong acid while solution Q is a strong base. On the pH scale, where would you place the solutions P and Q? (1)
- b. A solution has a pH of 7. Name a compound you would use to (i) increase its pH, and (ii) decrease its pH. (1)
- c. i. When the pH of a solution is decreased from 4 to 2, what effect does it produce on its hydronium ion concentration? State the colour change shown by the pH paper. (2)

OR

- ii. A person is feeling pain and irritation in the stomach due to indigestion. What could be the pH of the fluid in the stomach? Write the common name of the medicines people use for remedy. Give the chemical name of "milk of magnesia" often used for this purpose. (2)

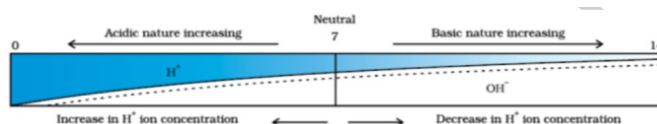
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- 54.** A scale for measuring hydronium ion in a solution is called the pH scale. The pH of a neutral solution is 7. A value of less than 7 on the pH scale represents an acidic solution. As the pH value, increases from 7 to 14 it represents OH^- ion concentration in solution i.e a basic solution. **4**



- i.** What is the pH range of the Human Body? (1)
- ii.** The strength of acid and bases depends on which factor? (1)
- iii.** If the pH of soil X is 7.5 while that of soil Y is 4.5, then which soil should be treated with powdered chalk to adjust its pH? (2)

OR

Tooth decay starts when the pH of the mouth is lower than which pH? (2)

- 55.** The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions. **4**

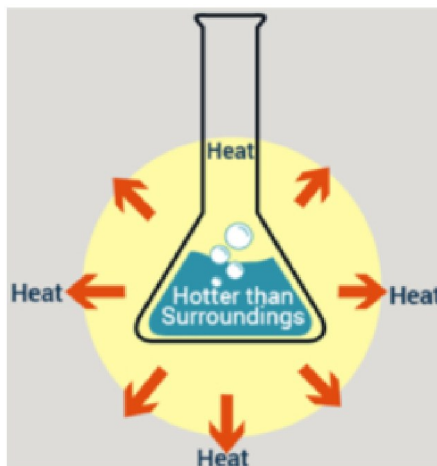
Group A - Lemon juice, vinegar, colourless aerated drink Group B - Tomato juice, coffee, ginger juice Group C - Sodium hydroxide, sodium chloride, lime water

- i.** For the solutions provided, which group is/are likely to have pH value (i) less than 7, and (ii) greater than 7? (1)
- ii.** List two ways of determining pH of a solution. (1)
- iii.** Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels. (2)

OR

pH has great importance in our daily life. Justify this statement by giving two examples. (2)

- 56.** The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets. **4**



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- i. What is the exothermic reaction? (1)
- ii. Write an example of an exothermic reaction. (1)
- iii. How will you obtain sulphuric acid from an acidic oxide? (2)

OR

While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid? (2)

- 57.** Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them. **4**
- a. Identify the acid and base from which Sodium chloride is formed. (1)
 - b. Find the cation and the anion present in Calcium sulphate. (1)
 - c. "Sodium chloride and washing soda both belong to the same family of salts." Justify this statement. (2)

OR

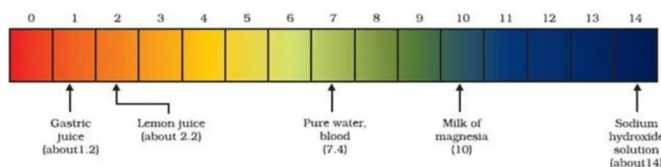
Define the term pH scale. Name the salt obtained by the reaction of Potassium hydroxide and Sulphuric acid and give the pH value of its aqueous solution. (2)

- 58.** Common salt is a very important chemical compound for our daily life. It's chemical name is sodium chloride and it is used as a raw material in the manufacture of caustic soda, washing soda, baking soda etc. It is also used in the preservation of pickles, butter, meat etc. **4**
- i. Name the acid and the base from which common salt can be obtained. (1)
 - ii. State the nature (acidic/basic/neutral) of sodium chloride. Give reason for the justification for your answer. (1)
 - iii. A. What happens when electric current is passed through an aqueous solution of sodium chloride (called brine)? Name the products obtained along with the corresponding places in the electrolytic cell where each of these products is obtained. (2)

OR

- B.** How is washing soda obtained from sodium chloride? Give chemical equation of the reactions involved in the process. (2)

- 59.** The strength of acid and base depends on the number of H^+ and the number of OH^- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be weak acids. Can you now say what weak and strong bases are? **4**



- i. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? (1)
- ii. Is Gastric juice a weak acid? (1)
- iii. Milk of magnesia is an acid or base? For what purpose it can be used? (2)

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OR

What is the pH value of saliva after the meal? (2)

- 60.** Seawater contains many salts dissolved in it. Common salt is separated from these salts. Deposits of solid salt are also found in several parts of the world. These large crystals are often brown due to impurities. This is called rock salt and is mined like coal. The common salt is an important raw material for chemicals of daily use. **4**

- a. Write balanced chemical equations to show the products formed during electrolysis of brine. (1)
- b. List two uses of any one product obtained during electrolysis of brine. (1)
- c. i. A mild non-corrosive basic salt 'A', used for faster cooking, is strongly heated to produce a compound 'B', that is used for removing permanent hardness of water. Identify A and B and also write the equation for the reaction that occurs when A is heated. (2)

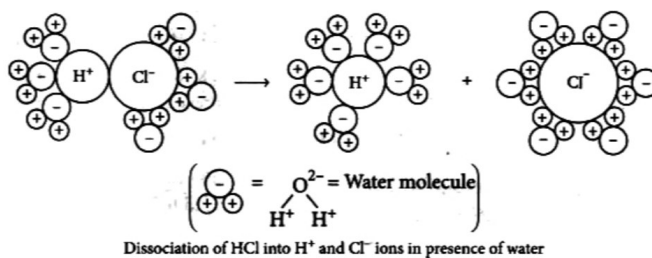
OR

- ii. Define water of crystallisation. Give two examples of salts that have water of crystallisation. (2)

- 61.** The acidic behaviour of acids is due to the presence of hydrogen (H^+) ions in them. They produce hydrogen ions in the presence of water. Water is a polar solvent and this property of water helps in weakening the bond between the ions and makes them soluble. **4**

Hence, acids and bases produce ions in aqueous solutions. It may be noted that a dry HCl gas or a solution of hydrogen chloride in organic, non-polar solvents like toluene or benzene do not show acidic properties. This is because hydrogen chloride does not undergo ionization in toluene.

The reason why HCl splits into H^+ and Cl^- ions in presence of water lies in the fact that water molecules, being polar, pull the H^+ and Cl^- ions apart and thus, the bond in HCl is broken.



- i. Which acids are present in bee stings? (1)
- ii. If the pH of a solution is 8, then find its $[H^+]$ ion. (1)
- iii. If you are given water, Hydrochloric acid, and Acetic acid, then mention increasing the order of acid strength. (2)

OR

If you are provided H_3PO_4 , C_2H_5OH , H_2CO_3 , and CH_3COOH , then which compound does not give H^+ ions in an aqueous solution? (2)

- 62.** Salt of a strong acid and strong base is neutral with a pH value of 7. NaCl common salt is formed by a combination of hydrochloride and sodium hydroxide solution. This is the salt that is used in food. Some salt is called rock salt, bed of rock salt was formed when seas of bygone ages dried up. The common salt thus obtained is an important raw material for various materials of daily use, such as sodium hydroxide, baking soda, washing soda, and bleaching powder. **4**

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- i. If given acids are phosphoric acid, carbonic acid, hydrochloric acid and sulphuric acid, then which acid does not form an acidic salt? (1)
- ii. What is the formula of baking soda? (1)
- iii. Name the substance which on treatment with chlorine to obtain bleaching powder. (2)

OR

Which salt is used for removing the permanent hardness of water? (2)

- 63.** On the basis of reactivity metals are grouped into three categories-

4

- i. Metals of low reactivity
- ii. Metals of medium reactivity
- iii. Metals of high reactivity

Therefore metals are extracted in pure form from their ores on the basis of their chemical properties. Metals of high reactivity are extracted from their ores by electrolysis of the molten ore. Metals of low reactivity are extracted from their sulphide ores, which are converted into their oxides. The oxides of these metals are reduced to metals by simple heating.

- i. Name the process of reduction used for a metal that gives vigorous reaction with air and water both. (1)
- ii. Carbon cannot be used as a reducing agent to obtain aluminium from its oxide? Why? (1)
- iii. Describe briefly the method to obtain mercury from cinnabar. Write the chemical equation for the reactions involved in the process. (2)

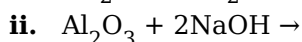
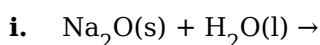
OR

Differentiate between roasting and calcination giving chemical equation for each. (2)

- 64.** Almost all metals combine with oxygen to form metal oxides. Metal oxides are generally basic in nature. But some metal oxides show both basic as well as acidic behaviour. Different metals show different reactivities towards oxygen. Some react vigorously while some do not react at all.

4

- i. What happens when copper is heated in air? (Give the equation of the reaction involved). (1)
- ii. Why are some metal oxides categorized as amphoteric? Give one example. (1)
- iii. Complete the following equations: (2)



OR

On burning Sulphur in oxygen a colourless gas is produced. (2)

- i. Write chemical equation for the reaction.
- ii. Name the gas formed.
- iii. State the nature of the gas.
- iv. What will be the action of this on a dry litmus paper?

- 65.** Non-metals are either solids or gases. Non-metal can exist in different forms such as carbon. Each form is called allotrope. Alkali metal is so soft that it can be cut with a knife. They have low density and low melting point. Some metal can melt if they are kept in the palm.

4

- i. What are the physical properties of metals? (1)

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- ii. Differentiate between the physical properties of metals and non metals? (1)
- iii. Give some exception of metals which does not obey the properties of metals? (2)

OR

Why is sodium always kept in kerosene oil? (2)

- 66.** Non-metals are highly electronegative in nature. They have a tendency to gain electrons in their valence shell to achieve nearest noble gas configuration. Thus, they form anions and act as good oxidising agents. **4**

$X + ne^- \rightarrow X^{n-}$ (non-metal atom $\rightarrow$ anion) They react with air or oxygen on heating to form oxides which react with water to form acids. Thus, non-metal oxides are acidic in nature. Non-metals do not react with dilute acids at all. This is because they are electronegative and therefore, cannot displace hydrogen from acids but they form covalent hydrides when heated with hydrogen.

- i. What happens when sulphur trioxide reacts with water? (1)
- ii. Why non-metals are electronegative in nature? (1)
- iii. Why non-metals generally act as oxidising agents? (2)

OR

Why do non-metals not react with dilute acids? (2)

- 67.** Three metal samples of magnesium, aluminium and iron were taken and rubbed with sand paper. These samples were then put separately in test tubes containing dilute hydrochloric acid. Thermometers were also suspended in each test tube so that their bulbs dipped in the acid. The rate of formation of bubbles was observed. The above activity was repeated with dilute nitric acid and the observations were recorded. **4**

Answer the following questions:

- a. When activity was done with dilute hydrochloric acid, then in which one of the test tubes was the rate of formation of bubbles the fastest and the thermometer showed the highest temperature? (1)
- b. Which metal did not react with dilute hydrochloric acid? Give reason. (1)
- c. Why is hydrogen gas not evolved when a metal reacts with dilute nitric acid? Name the ultimate products formed in the reaction. (2)

OR

Name the type of reaction on the basis of which reactivity of metals is decided. You have two metals X and Y. How would you decide which is more reactive than the other? (2)

- 68.** Metals are required for a variety of purposes. For this we need their extraction from their ores. Ores mined from the earth are usually contaminated with many impurities which must be removed prior to the extraction of metals. The extraction of pure metal involves the following steps: **4**

1. Concentration of ore 2. Extraction of the metal from the concentrated ore 3. Refining of the metal

- i. Name an ore of Mercury and state the form in which Mercury is present in it. (1)
- ii. What happens to zinc carbonate when it is heated strongly in a limited supply of air? (1)
- iii. The reaction of a metal A with Fe_2O_3 is highly exothermic and is used to join railway tracks. (2)
- a. Identify the metal A and name the reaction taking place.

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- b.** Write the chemical equation for the reaction of metal A with Fe_2O_3 .

OR

We cannot use carbon to obtain sodium from sodium oxide. Why? State the reactions taking place at cathode and anode during electrolytic reduction of sodium chloride. (2)

- 69.** The metals produced by various reduction processes are not very pure. They contain impurities, which must be removed to obtain pure metals. The most widely used method for refining impure metals is electrolytic refining. **4**

- i.** What is the cathode and anode made of in the refining of copper by this process? (1)
- ii.** Name the solution used in the above process and write its formula. (1)
- iii.** How copper gets refined when electric current is passed in the electrolytic cell? (2)

OR

You have two beakers A and B containing copper sulphate solution. What would you observe after about 2 hours if you dip a strip of zinc in beaker A and a strip of silver in beaker B? Give reason for your observations in each case. (2)

- 70.** Many pure metals like copper, iron and gold are very soft and as such are considered unsuitable for certain uses. Metallic objects around us such as cooking utensils, statues, ornaments, guns etc. are actually not made up of pure metals. Instead of pure metals, alloys are used in the design of most of the useful objects. Making alloys enhances the basic properties of a metal which is the primary constituent (metal) of an alloy. **4**

- I.** How does electrical conductivity and melting point of a metal change when it is converted to its alloy by mixing a small amount of an element in it? (1)
- II.** Name an alloy used for welding two wires together in an electric circuit. Write its major constituents. (1)
- III. a.** What are alloys? How is 'Brass' (an alloy) prepared? (2)

OR

- b.** What is stainless steel? How is it prepared? Write one important property which makes it more useful in making cooking utensils as compared to its primary metal. (2)

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SECTION - C (BIOLOGY)

This section consists of 50 case based questions of 4 marks each.

- 71.** The maintenance functions of all living organisms must go on even when they are not doing anything particular. Even when we are just sitting in a class or even asleep, this maintenance job has to go on. These maintenance processes require energy to prevent damage and break-down of cells and tissues, which is obtained by the individual organism from the food prepared by the autotrophs, called producers. **4**
- a.** Name and define the process by which green plants prepare food. (1)
- b.** Write chemical equation involved in the above process. (1)
- c. i.** State in proper sequence the events that occur in synthesis of food by desert plants. (2)

OR

- ii.** Explain giving reasons what happens to the rate at which the green plants will prepare food. (2)
- I.** during cloudy weather, and
- II.** when stomata get blocked due to dust.
- 72.** Nutrition is the process of taking food by an organism and the utilization of food for energy. This is a vital process that helps living beings obtain their energy from various sources. **4**
- Nutrients are substances that provide nutrition.
- The mode of nutrition varies from one species to another. Plants do photosynthesis to prepare their own food. Animals depend on plants for food.



- i.** What do you understand by nutrition? (1)
- ii.** Mention how organisms like bread moulds and mushrooms obtain their food. (1)
- iii.** What do you understand by autotrophic nutrition? (2)

OR

What is common for Cuscuta, ticks, and leeches? (2)

- 73.** Kidneys are vital organs for survival. Several factors like infections, injury or restricted blood flow to kidneys reduce the activity of kidneys. This leads to accumulation of poisonous wastes in the body, which can even lead to death. In case of kidney failure, an artificial kidney can be used. An artificial kidney is a device to remove waste products from the blood through dialysis. **4**
- a. i.** Name the artery that brings oxygenated blood to the kidney.
- ii.** Name the cluster the thin-walled blood capillaries present in the Bowman's capsule. (1)

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- b.** In human excretory system name the organ which stores urine. Is this organ under hormonal control or nervous control? (1)
- c.** List two major steps involved in the formation of urine and state in brief their functions. (2)

OR

In which part of the nephron does selective reabsorption take place? List the factors which the amount of water reabsorbed depends on. (2)

- 74.** Human digestive system is a tube running from mouth to anus. Its main function is to breakdown complex molecules present in the food which cannot be absorbed as such into smaller molecules. These molecules are absorbed across the walls of the tube and the absorbed food reaches each and every cell of the body where it is utilised for obtaining energy. **4**

- a.** Name the glands present in the buccal cavity and write the components of food on which the secretion of these glands act upon. (1)
- b.** Two organs have a sphincter muscle at their exit. Name them. (1) What will happen if:
 - i.** mucus is not secreted by the gastric glands.
 - ii.** Villi are absent in the small intestine. (2)

OR

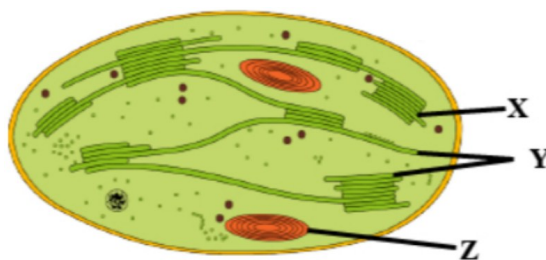
Bile juice does not contain any enzyme, yet it has important roles in digestion. Justify the statement. (2)

- 75.** The green plants make their food, through photosynthesis and are therefore called autotrophs. All other organisms depend upon green plants for food and are referred to as heterotrophs. Green plants carry out photosynthesis by using light energy of sun. The first phase of reactions are directly light driven therefore called light reactions. The second phase of reactions are not directly light driven but are dependent on the products of light reactions and are called dark reactions. **4**

- i.** What is produced during the light phase of photosynthesis? (1)
- ii.** How many sugar molecules are produced in the overall process of photosynthesis? (1)
- iii.** A plant is provided with ideal conditions for photosynthesis and supplied with isotope $^{14}\text{CO}_2$. When the products of the process are analysed carefully, what would be the nature of products? (2)

OR

What are the accurate functions corresponding to parts X, Y, and Z as depicted in the provided diagrammatic representation of an electron micrograph of a section of a chloroplast? (2)



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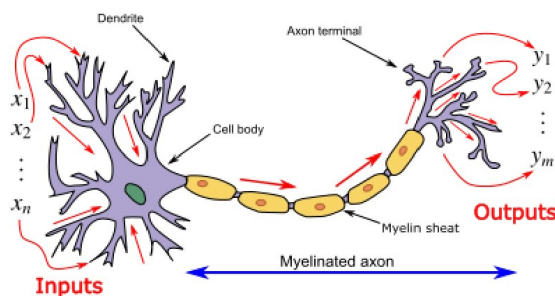
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- 76.** In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell, see figure, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end.

4



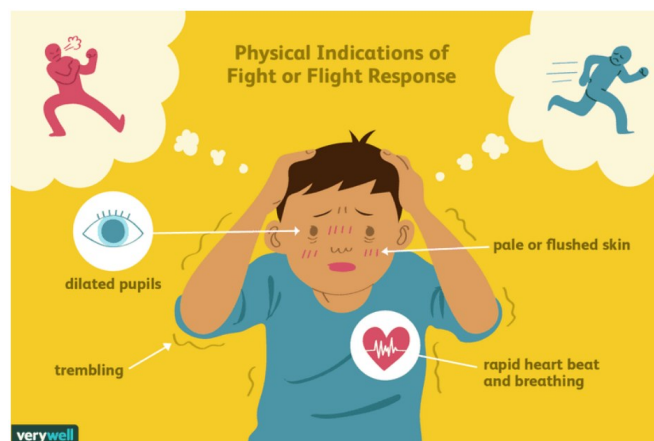
- i. Name the largest cell present in the body. (1)
- ii. What is an axon? (1)
- iii. Name one gustatory receptor and one olfactory receptor present in a human beings. (2)

OR

Name the following parts of a neuron: (2)

- a. Where information is acquired.
 - b. Through which information travels as an electrical impulse.
- 77.** Adrenaline is secreted directly into the blood and carried to different parts of the body. The target organs or the specific tissues on which it acts include the heart. As a result, the heart beats faster, resulting in the supply of more oxygen to our muscles. The blood to the digestive system and skin is reduced due to contraction of muscles around small arteries in these organs. This diverts the blood to our skeletal muscles. The breathing rate also increases because of the contractions of the diaphragm and the rib muscles. All these responses together enable the animal body to be ready to deal with the situation. Such animal hormones are part of the endocrine system which constitutes the second way of control and coordination in our body.

4



- i. How does chemical coordination take place in animals? (1)

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- ii. Which hormone is called an emergency hormone? (1)
- iii. Where are the adrenal gland present in our body? (2)

OR

How does our body respond when adrenaline is secreted into the blood? (2)

78. In life there are certain changes in the environment called 'stimuli' to which we respond appropriately. Touching a flame suddenly is a dangerous situation for us. One way is to think consciously about the possibility of burning and then moving the hand. But our body has been designed in such a way that we save ourself from such situations immediately.

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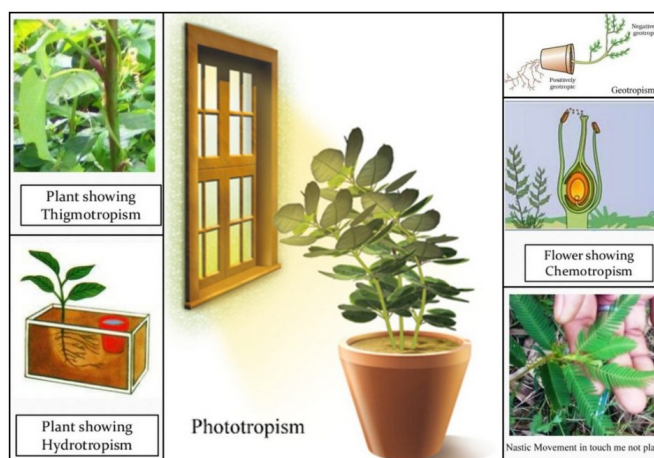
- i. Name the action by which we protect ourself in the situation mentioned above and define it. (1)
- ii. Write the role of (a) motor and (b) relay neuron. (1)
- iii. A. What are the two types of nervous system in human body? Name the components of each of them. (2)

OR

- B. Which part of the human brain is responsible for: (2)
 - a. thinking
 - b. picking up a pencil
 - c. controlling blood pressure
 - d. controlling hunger

79. Animals have a nervous system for controlling and coordinating the activities of the body. But plants have neither a nervous system nor muscles. So, how do they respond to stimuli? When we touch the leaves of a chhui-mui (the 'sensitive' or 'touch-me-not' plant of the Mimosa family), they begin to fold up and droop. When a seed germinates, the root goes down, the stem comes up into the air. What happens? Firstly, the leaves of the sensitive plant move very quickly in response to touch. There is no growth involved in this movement. On the other hand, the directional movement of a seedling is caused by growth. If it is prevented from growing, it will not show any movement. So plants show two different types of movement - one dependent on growth and the other independent of growth.

4



- i. Plants neither have nervous system nor muscles, then how does chemical coordination occur in plants? (1)
- ii. Why Mimosa pudica leaves drop down when we touched? Write its another name also. (1)

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iii. What is turgor movement? (2)

OR

What is a tropic movement? Explain with an example. (2)

80. You must have noticed many dramatic changes in your appearance as well as that of your friends as you approached 10-12 years of age. These changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females. Do you know anyone in your family or friends who has been advised by the doctor to take less sugar in their diet because they are suffering from diabetes? As a treatment, they might be taking injections of insulin. This is a hormone that is produced by the pancreas.

4

i. Why is pancreas a dual gland? (1)

ii. Name the hormone which is secreted by males and females during adolescence. (1)

iii. What happens if Insulin is not secreted in the proper amount? (2)

OR

From which cells of pancreatic islets insulin and glucagon hormone are secreted? (2)

81. A person while climbing up a rocky hill comes into a panic state and fear. His body starts reacting in a "flight-or-flight" condition to adjust to the dangerous and stressful situation. Based on the above facts, answer the questions that follow.

4

a. i. Name the hormone secreted in the blood of the person in this situation. (2)

OR

ii. Name the source gland of the hormone secreted in this condition. (2)

b. State any two responses in the body of the person as a result of the secretion of this hormone. (1)

c. How does the action of the chemical signal in terms of hormones differ from the electrical impulses via nerve cells? (1)

82. We have seen that the different parts of our body have specific functions. Our mouth waters when we see the food we like without our meaning to. Our heart's beat without our thinking about it. In fact, we cannot control these actions easily by thinking about them even if we wanted to. So, in between the simple reflex actions like change in the size of the pupil, and the thought out actions such as moving a chair, there is another set of muscle movements over which we do not have any thinking control. Many of these involuntary actions are controlled by the mid-brain and hind-brain. All these involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain. Think about activities like walking in a straight line, riding a bicycle, picking up a pencil. These are possible due to a part of the hind-brain called the cerebellum. It is responsible for the precision of voluntary actions and maintaining the posture and balance of the body. Imagine what would happen if each of these events failed to take place if we were not thinking about it.

4



i. Identify the part of the nervous system which controls the reflex action. (1)

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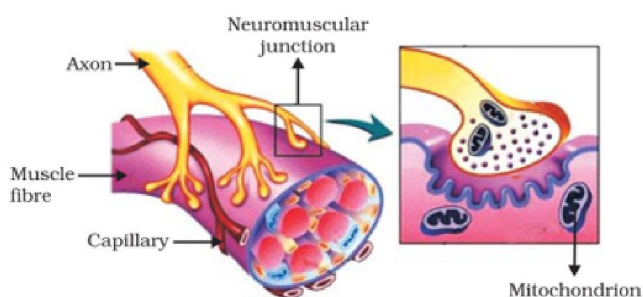
- ii. Does reflex action involve all parts of the voluntary nervous system? (1)
- iii. Identify the part of the autonomic nervous system which controls involuntary actions. (1)

OR

Beating of heart muscles, which type of action is this? Out of voluntary and involuntary action which is slower? (2)

- 83.** In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end. At the end of the axon, the electrical impulse sets off the release of some chemicals. These chemicals cross the gap, or synapse, and start a similar electrical impulse in the dendrite of the next neuron. This is a general scheme of how nervous impulses travel in the body. A similar synapse finally allows the delivery of such impulses from neurons to other cells, such as muscles cells or glands.

4



- i. Why does the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron take place but not in the reverse direction? (1)
- ii. From where the electrical impulse travels? (1)
- iii. Name the chemical which released at the end of axon to transmit the signal to the other neuron. (2)

OR

What happens at the synapse between 2 neurons? (2)

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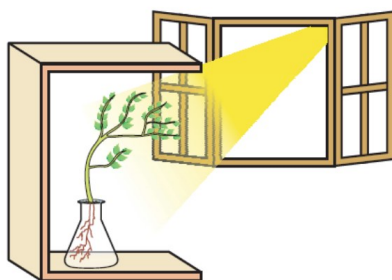
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- 84.** Fill a conical flask with water. Cover the neck of the flask with a wire mesh. keep two or three freshly germinated bean seeds on the wire mesh. Take a cardboard box which is open from one side. Keep the flask a wire mesh. Kin the box in such a manner that the open side of the box faces light coming from a window as shown in the given figure. After two or three days, you will notice that the shoots bend towards light and roots away from light. Now turn the flask so that the shoots are away from light and the roots towards the light. Leave it undisturbed in this condition for a few days. Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is obviously, geotropism.

4



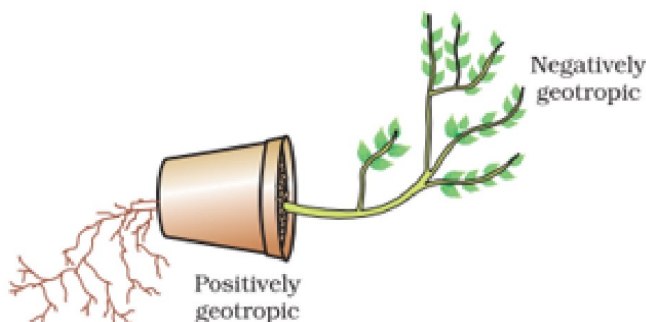
- i. What has represented by the given activities? (1)
- ii. Do old parts of the shoot and root change direction? Is there any difference in the direction of the new growth? (1)
- iii. What can we conclude from this activity? (2)

OR

What is geotropism? (2)

- 85.** Environmental triggers such as light, or gravity will change the directions that plant parts grow in. These directional, or tropic, movements can be either towards the stimulus or away from it. So, in two different kinds of phototropic movement, shoots respond by bending towards light while roots respond by bending away from it. How does this help the plant? Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is, obviously, geotropism. If 'hydro' means water and 'chemo' refers to chemicals, what would 'hydrotropism' and 'chemotropism' mean? Can we think of examples of these kinds of directional growth movements? One example of chemotropism is the growth of pollen tubes towards ovules, about which we will learn more when we examine the reproductive processes of living organisms.

4



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- i. Where does negative phototropism occur in plants? (1)
- ii. Phototropism in shoots is attributed due to which plant hormone? (1)
- iii. Tendrils exhibit/ twining of tendrils show which type of tropic movement? (2)

OR

If the stem grows towards sunlight and the root grows just opposite to it, then what type of movement of the stem is it? (2)

- 86.** The growth movements of plant parts in which the direction of the stimulus determines the direction of the response is known as tropic movements or tropism. Plants also have non-directional movements which may not be growth dependent. **4**



- I. Name the movement which causes 'X' and 'Y' to grow downwards and upwards respectively. (Refer above figure) (1)
- II. Write the name of a hormone that plays a major role in (i) falling of leaves (ii) rapid cell division (1)
- III. a. Leaves of the sensitive plant move very quickly in response to 'touch'. How is this stimulus of touch communicated and explain how the movement takes place. (2)

OR

- b. Name the plant hormone which is synthesized at the shoot tip. How does this hormone helps the plant to bend towards light? (2)

- 87.** Following questions are based on the two tables given below. Study these tables related to blood sugar levels: **4**

Table A: Blood glucose chart	Mean Blood Glucose Level (mg/dL)
Doctor's advice needed	380
	350
	315
	280
	250
	215
Good	180
	150
Excellent	115
	80
	50

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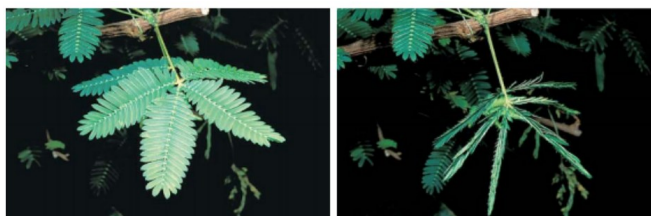
Table B: Blood Report of Patient X and Y (mg/dL)	Patient X	Patient Y
Before breakfast (Fasting)	<100	70-130
Before lunch, supper and snack	<110	70-130
Two hours after meals	<140	<180
Bedtime	<120	90-150

- i. Refer to Table B showing the blood report of the levels of glucose of patients X and Y. Infer the disease which can be diagnosed from the given data. (1)
- ii. Identify the hormone whose level in the blood is responsible for the above disease. (1)
- iii. High/low sugar and a low/high-fat diet What would you recommend to the affected patient? (2)

OR

Refer to Table A and suggest the value of the mean blood glucose level beyond which doctor's advice is necessary. (2)

- 88.** Animals have a nervous system for controlling and coordinating the activities of the body. But plants have neither a nervous system nor muscles. So, how do they respond to stimuli? When we touch the leaves of a chui-mui (the 'sensitive' or 'touch-me-not' plant of the Mimosa family), they begin to fold up and droop. When a seed germinates, the root goes down, the stem comes up into the air. What happens? Firstly, the leaves of the sensitive plant move very quickly in response to touch. There is no growth involved in this movement. On the other hand, the directional movement of a seedling is caused by growth. If it is prevented from growing, it will not show any movement. **4**



- i. Write the types of movement. (1)
- ii. Give an example of a plant hormone that promotes growth. (1)
- iii. What is the function of the nervous system? (2)

OR

How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light? (2)

- 89.** The modes by which various organisms reproduce depend on the body design of the organisms. In asexual reproduction, a single individual parent produces offsprings without the involvement of gametes. This method is a common means of increasing the off-springs rapidly under favourable conditions. Asexual reproduction occurs mostly in unicellular organisms, some plants and certain simple multicellular animals. **4**
- i. Why is regeneration not same as reproduction? (1)
 - ii. List any two advantages of producing plants through vegetative propagation. (1)
 - iii. Explain the process of budding in Hydra. (2)

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OR

What happens when

- I.** a spirogyra filament matures and attains a considerable length, and
- II.** a sporangia in Rhizopus bursts on maturation? (2)

- 90.** The modes by which various organisms reproduce depend on the body design of the organisms. In asexual reproduction, a single individual parent produces off-springs without the involvement of gametes. This method is a common means of increasing the offsprings rapidly under favourable conditions. Asexual reproduction occurs mostly in unicellular organisms, some plants and certain simple multicellular animals. **4**
- i.** Leaves of Bryophyllum when they fall on the soil develop into new plants whereas a banana leaf will not be able to do so. Why? (1)
 - ii.** State the name of the organism in which binary fission takes place in a definite orientation. Also, name the disease caused by this organism. (1)
 - iii.** Explain the process of budding in Hydra. (2)

OR

What happens when (2)

- I.** a spirogyra filament matures and attains a considerable length, and
- II.** a sporangia in Rhizopus bursts on maturation?

- 91.** All the reproductive methods of living organisms are broadly categorized into two types: 1. Asexual reproduction, and 2. Sexual reproduction. **4**
- Asexual reproduction involves the participation of a single parent without the formation of gametes, fertilisation and transfer of genetic material. This method is a common means of rapidly increasing off springs under favourable conditions.
- i.** Name the type of fission that occurs in Leishmania and Plasmodium. (1)
 - ii.** Write one advantage of sexual mode of reproduction over asexual reproduction. (1)
 - iii.** Give reasons why: (2)
 - a.** Colonies of yeast fail to multiply in water but multiply in sugar solution.
 - b.** Rhizopus individuals do not grow on a dry slice of bread.

OR

Name the filamentous structures a student could identify when he collected water from a pond that appeared dark green. How do these organisms multiply? Explain. (2)

- 92.** The modes by which various organisms reproduce depend on the body design of the organisms. In asexual reproduction, a single individual parent produces offsprings without the involvement of gametes. This method is a common means of increasing the offsprings rapidly under favourable conditions. Asexual reproduction occurs mostly in unicellular organisms, some plants and certain simple multicellular animals. **4**
- i.** State the name of the organism in which binary fission takes place in a definite orientation. Also name the disease caused by this organism. (1)
 - ii.** List any two advantages of producing plants through vegetative propagation. (1)
 - iii.** Explain the process of budding in Hydra. (2)

OR

What happens when (2)

- I.** a spirogyra filament matures and attains a considerable length, and
- II.** a sporangia in Rhizopus bursts on maturation?

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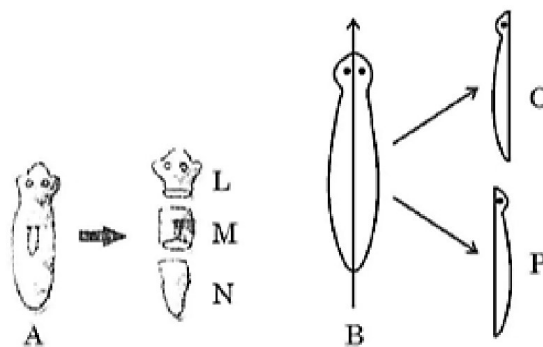
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- 93.** Pollination is an important process in sexual reproduction of plants. It is an essential process that facilitates fertilisation in plants. Pollinating agents can be wind, water, insects and birds. Several changes take place in the flower after the fertilization has taken place. **4**
- Write the main difference between self-pollination and cross-pollination. (1)
 - Name the part of the flower which attracts insects for pollination. What happens to this part after fertilisation? (1)
 - Define fertilisation. What is the fate of ovules and the ovary in a flower after fertilisation? (2)

OR

In a germinating seed, which parts are known as future shoot and future root? Mention the function of cotyledon. (2)

- 94.** Asexual reproduction involves a single parent to produce offsprings without the formation of gametes. It occurs by the following ways : Fission, Budding, Fragmentation, Spore formation and Regeneration. In one of the methods like regeneration, Planaria A is cut horizontally into three pieces -L, M and N and Planaria B is cut vertically into two equal halves -O and P. **4**



- Which of the cut pieces of the two Planaria could regenerate to form a complete organism? (1)
- Give an example of another organism which follows the same mode of reproduction as Planaria. (1)
- What is the meaning of 'development' in regeneration? (2)

OR

Differentiate between regeneration and fragmentation. (2)

- 95.** Renu collected some pond water which was dark green in colour in a test tube. She took out green coloured mass from it and separated its filaments by using needles. She broke some filaments into small fragments and put them in a Petri dish containing clean water. She observed that after few days the small fragments gave rise to complete filaments. **4**
- What do you think the mass of green filament was? (1)
 - The small fragment gave rise to new filament. What does it indicate? (1)
 - Give an example of organism which reproduces in similar way as Spirogyra. (2)

OR

Illustrate the process when an organism breaks down into several fragments. (2)

- 96.** When a girl is born, the ovaries already contain thousands of immature eggs. On reaching puberty, some of these start maturing. One matured egg is released every month by one of the ovaries. The two oviducts unite into an elastic bag-like structure known as uterus. **4**

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- a. Write the site of fertilization in human female. (1)
- b. How does the uterus prepare itself to receive and nurture the growing embryo? Explain. (1)
- c. i. What happens when the egg is not fertilized? (2)

OR

- ii. How does the developing embryo get nutrition from the mother's blood? Explain. (2)

97. Pooja is very fond of gardening. She has different flowering plants in her garden. One day few naughty children entered her garden and plucked many leaves of Bryophyllum plant and threw them here and there in the garden. After few days, Pooja observed that new Bryophyllum plants were coming out from the leaves which fell on the ground. **4**

- i. Give an examples of plants that can propagate vegetatively through leaves like Bryophyllum? (1)
- ii. Do you think any other vegetative part of Bryophyllum can help in propagation? If yes, then which part? (1)
- iii. Give an example of plants that can artificially propagated (vegetatively) by stem cuttings in horticultural practices? (2)

OR

Give some examples other than bryophyllum which can propagates through their leaves pieces? (2)

98. Plantation drives are often carried out especially during monsoon season for the protection of our environment. Such programmes need a lot of saplings for tree plantation. Plants are propagated by sexual or asexual means in fields and nurseries. Over the years horticulturists have developed asexual methods that use vegetative parts of the plants to multiply. Many plants can reproduce by this method naturally as well as by artificial means. **4**

- a. Which specific part of the plant is used for sexual and asexual means of propagation to produce a new plant? (1)
- b. Give one example of (i) a flower, and (ii) a fruit grown by vegetative propagation. (1)
- c. i. List two advantages of growing plants by vegetative propagation. (2)

OR

- ii. Describe an activity to show how potatoes reproduce asexually. (2)

99. Refer to the given table regarding results of F_2 generation of Mendelian cross. **4**

Seed type	Number of plants
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? (1)

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- ii. What would be the genotype of parental generation regarding the given result of F_2 generation? (1)
- iii. 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? (2)

OR

What will result when plant YyRr is self-pollinated? (2)

- 100.** All human chromosomes are not paired. Most human chromosomes have a maternal and a paternal copy, and we have 22 such pairs. But one pair called the sex chromosomes, is odd in not always being a perfect pair. Women have a perfect pair of sex chromosomes. But men have a mismatched pair in which one is normal sized while the other is a short one. **4**
- i. In humans, how many chromosomes are present in a Zygote and in each gamete? (1)
 - ii. A few reptiles rely entirely on environmental cues for sex determination. Comment. (1)
 - iii. The sex of a child is a matter of chance and none of the parents are considered to be responsible for it. Justify it through flow chart only. (2)

OR

Why do all the gametes formed in human females have an X chromosome? (2)

- 101.** A student crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds. He found that only one type of seeds were produced in the F_1 generation. When these F_1 generation pea plants were self-pollinated with each other, then in addition to the seed type of F_1 generation, some new types of seed combinations were also obtained in the F_2 generation. **4**
- i. Mention the dominant traits observed in F_1 generation. (1)
 - ii. What are the new possible combinations of seeds likely to be observed in F_2 generation? (1)
 - iii. Give reason why the traits which were not visible in the seeds of F_1 generation reappeared in the seeds of F_2 generation. Write the ratio of different types of seeds obtained in F_2 generation in this case. (2)

OR

What is meant by the terms (I) dominant, and (II) recessive traits? Explain. (2)

- 102.** Sex of an individual is determined by different factors in various species. Some animals rely entirely on the environmental cues, while in some other animal's the individuals can change their sex during their life time indicating that sex of some species is not genetically determined. However, in human beings, the sex of an individual is largely determined genetically. **4**
- i. Write the number of chromosomes present in human beings apart from sex chromosomes. Which of the parent has a mismatched pair of sex chromosomes? (1)
 - ii. In what way are the sex chromosomes X and Y different in size? Name the mismatched pair of sex chromosome in humans. (1)
 - iii. Citing two examples, justify the statement Sex of an individual is not always determined genetically. (2)

OR

Draw a flow chart to show that sex is determined genetically in human beings. (2)

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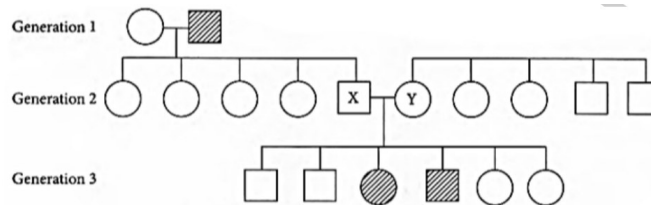
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- 103.** Refer to the schematic representation of albinism which is an inherited condition caused by a recessive allele (a). 'A' is the dominant allele for the normal condition. The inheritance of certain genetic traits for two or more generations is represented in a pedigree or family tree. Study the given pedigree chart and answer the following questions.

4



- i. What could be the genotypes of X and Y? (1)
- ii. What could be the genotype of generation - 1 male and female? (1)
- iii. If X married an albino female, then what is the probability that their children would be albino? (2)

OR

If Y married a normal homozygous male, then what is the probability that their children would be albino? (2)

- 104.** A purebred pea plant with smooth seeds (dominated characteristic) was crossed with a purebred pea plant with wrinkled seeds (recessive characteristic). The F_1 generation was self-pollinated to give rise to the F_2 generation.

4

- i. What will be the genotypic ratio of the given F_2 generation? (1)
- ii. What is the expected observation of the F_2 generation of plants? (1)
- iii. If a genotype consists of different types of alleles, what is it called? (2)

OR

What is the alternative form of the gene? (2)

- 105.** Pea plants can have smooth seeds or wrinkled seeds. One of the phenotypes is completely dominant over the other. A farmer decides to pollinate one flower of a plant with smooth seeds using pollen from a plant with wrinkled seeds. The resulting pea pod has all smooth seeds.

4

- i. Which crosses will give smooth and wrinkled seeds in the same proportion? (1)
- ii. Which cross can be used to determine the genotype of a plant with a dominant phenotype? (1)
- iii. On the crossing of two heterozygous smooth seeded plants (Rr), a total of 1000 plants were obtained in F_1 generation. What will be the respective number of smooth and wrinkled seeds obtained in F_1 generation? (2)

OR

Which characters appear in the first filial generation? (2)

- 106.** Sex of an individual is determined by different factors in various species. Some animals rely entirely on the environmental cues, while in some other animals the individuals can change their sex during their life time indicating that sex of some species is not genetically determined. However, in human beings, the sex of an individual is largely determined genetically.

4

- i. What is the statistical probability of getting either a male child or a female child? (1)

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- ii. Write the number of pair/pairs of sex chromosomes present in human beings. In which one of the parent (male/female) perfect pair I pairs of sex chromosomes are present? (1)
- iii. Citing two examples, justify the statement Sex of an individual is not always determined genetically. (2)

OR

Draw a flow chart to show that sex is determined genetically in human beings. (2)

107. Sex determination is the method by which distinction between males & females is established in a species. The sex of an individual is determined by specific chromosomes. These chromosomes are called sex chromosomes or allosomes. X and Y chromosomes are called sex chromosomes. The normal chromosomes other than the sex chromosomes of an individual are known as autosomes.

4

- i. In XX-XO type of sex determination who produces two different types of gametes? (1)
- ii. A couple has six daughters. What is the possibility of their having a girl next time? (1)
- iii. What is the number of autosomes present in the liver cells of a human female? (2)

OR

XX-XO type of sex determination and XX-XY type of sex determination are examples of which heterogamety? (2)

108. A student crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds. He found that only one type of seeds were produced in the F_1 generation. When these F_1 generation pea plants were self-pollinated with each other, then in addition to the seed type of F_1 generation, some new types of seed combinations were also obtained in the F_2 generation.

4

- i. Which traits in the above mentioned cross are dominant traits? (1)
- ii. What are the new possible combinations of seeds likely to be observed in F_2 generation? (1)
- iii. Give reason why the traits which were not visible in the seeds of F_1 generation reappeared in the seeds of F_2 generation. Write the ratio of different types of seeds obtained in F_2 generation in this case. (2)

OR

What is meant by the terms (I) dominant, and (II) recessive traits? Explain. (2)

109. Sex of an individual is determined by different factors in various species. Some animals rely entirely on the environmental cues, while in some other animals the individuals can change their sex during their life time indicating that sex of some species is not genetically determined. However, in human beings, the sex of an individual is largely determined genetically.

4

- i. In what way are the sex chromosomes X and Y different in size? Name the mismatched pair of sex chromosome in humans. (1)
- ii. Write the number of pair/pairs of sex chromosomes present in human beings. In which one of the parent (male / female) perfect pair/pairs of sex chromosomes are present? (1)
- iii. Citing two examples, justify the statement Sex of an individual is not always determined genetically. (2)

OR

Draw a flow chart to show that sex is determined genetically in human beings. (2)

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110. The mechanism by which the sex of an individual is determined is called sex-determination. In human beings, sex of a newborn is genetically determined, whereas in some others it is not. There are 46 (23 pairs) chromosomes in human beings. Out of these, 44 (22 pairs) control the body characters and 2 (one pair) are known as sex chromosomes. The sex chromosomes are of two types- X chromosome and Y chromosome. At the time of fertilisation, depending upon which type of male gamete fuses with the female gamete, the sex of the newborn child is decided.

4

- i. If the gametes always have half the number of chromosomes, then how is the original number of chromosomes restored in the organism? (1)
- ii. Why is a pair of sex chromosomes in human beings called a mismatched pair in terms of type and size? (1)
- iii. Name two animals whose sex is not genetically determined. Explain the process of their sex determination. (2)

OR

With the help of a flowchart only, show how sex is genetically determined in human beings. (2)

111. In some families, either rural or urban, females are tortured for giving birth to a female child. They do not seem to understand the scientific reason behind the birth of a boy or a girl. In fact the mother is not responsible for the sex of the child and it has been genetically proved that the sex of a newborn is determined by what the child inherits from the father.

4

- i. State the basis on which the sex of a newborn baby is determined in humans. (1)
- ii. Why is the pair of sex chromosomes called a mismatched pair in males? (1)
- iii. How is the original number of chromosomes present in the parents restored in the progeny? (2)

OR

Explain by giving two examples of the organisms in which the sex is not genetically determined. (2)

112. In human beings, there are 23 pairs of chromosomes. Out of these 23 pairs of chromosomes (i.e. 46 chromosomes), 22 pairs of chromosomes are called autosomes and one pair of chromosomes. i.e. two chromosomes are called sex chromosomes. The sex chromosomes are of two types- 'X' chromosomes and 'Y' chromosomes. The sex of a child (i.e. progeny), is decided at the time of fertilisation. In other words, at the time of zygote formation the sex chromosomes inherited from the parents of a child decide whether the new born will be a boy or a girl.

4

- a. What are chromosomes? (1)
- b. Why is the pair of sex chromosomes in human males called mismatched pair? (1)
- c. A. Show with the help of a flow chart that the statistical probability of getting a boy or a girl is 50 : 50. (2)

OR

- B.** Mention two examples of animals where sex is not determined genetically like human beings. Describe in brief the method of sex determination in these animals. (2)

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UNIQUE STUDY POINT

CLASS X SCIENCE - CASE STUDY BASED QUESTIONS

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113. Mendel crossed tall and dwarf pea plants to study the inheritance of one gene. He collected the seeds produced as a result of this cross and grew them to generate plants of the first hybrid generation which is called the first filial progeny or F_1 . Mendel then self-pollinated the tall F_1 plants and he obtained F_2 generation. **4**

- i. In garden peas, the round shape of the seeds is dominant over the wrinkled shape. A pea plant heterozygous for the round shape of seed is selfed and 1600 seeds produced during the cross are subsequently germinated. How many seedlings would have a non-parental phenotype? (1)
- ii. If 'A' represents the dominant gene and 'a' represents its recessive allele, which of the following would be the most likely result in the first generation offspring when Aa is crossed with aa? (1)
- iii. What result Mendel would have got if he self-pollinated a homozygous tall F_2 plant? (2)

OR

In plants, the tall phenotype is dominant over the dwarf phenotype, and the alleles are designated as T and t, respectively. Upon crossing one tall and one dwarf plant, a total of 250 plants were obtained, out of which 124 displayed tall phenotype and rest were dwarf. Then, What would be the genotype of the parent plants? (2)

114. Mendel worked out the rules of heredity by working on garden pea using a number of visible contrasting characters. He conducted several experiments by making a cross with one or two pairs of contrasting characters of pea plant. On the basis of his observations he gave some interpretations which helped to study the mechanism of inheritance. **4**

- i. When Mendel crossed pea plants with pure tall and pure short characteristics to produce F_1 progeny, which two observations were made by him in F_1 plants? (1)
- ii. Write one difference between dominant and recessive trait. (1)
- iii. In a cross with two pairs of contrasting characters
RRYY (Round Yellow) $\times$ rryy (Wrinkled Green)

Mendel observed 4 types of combinations in F_2 generation. By which method did he obtain F_2 generation? Write the ratio of the parental combinations obtained and what conclusions were drawn from this experiment. (2)

OR

Justify the statement: "It is possible that a trait is inherited but may not be expressed." (2)

115. The cross that includes the inheritance of two pairs of contrasting characters simultaneously is referred to as a dihybrid cross. Mendel chose pure breeding plants for yellow and green seeds and round and wrinkled shape of seeds. He cross-pollinated the plant having yellow round seeds with the plant having green wrinkled seeds. All the plants produced in F_1 generation were having yellow round seeds. The plants raised from these seeds were self-pollinated, which resulted in the production of plants having four phenotypically different types of seeds. **4**

- i. What will be the percentage of yr gamete produced by YyRr parent? (1)
- ii. How many types of gametes can be produced by YYrr? (1)
- iii. In the Mendelian dihybrid cross, when a heterozygous tall plant with green seeds is self-crossed then what will be the progenies? (2)

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OR

When round yellow seeded heterozygous pea plants are self-fertilised, then what will be the frequency of occurrence of RrYY genotype among the offsprings? (2)

116. The mechanism by which the sex of an individual is determined is called sex-determination. In human beings, sex of a newborn is genetically determined, whereas in some others it is not. There are 46 (23 pairs) chromosomes in human beings. Out of these, 44 (22 pairs) control the body characters and 2 (one pair) are known as sex chromosomes. The sex chromosomes are of two types-X chromosome and Y chromosome. At the time of fertilisation, depending upon which type of male gamete fuses with the female gamete, the sex of the newborn child is decided.

4

- i.** What is the statistical probability of getting either a male or a female child? Justify your answer. (1)
- ii.** Out of male or female, which of them has a perfect pair of sex chromosomes? In case of a perfect pair, will the gametes produced be of the same kind or of a different kind? (1)
- iii.** Name two animals whose sex is not genetically determined. Explain the process of their sex determination. (2)

OR

With the help of a flowchart only, show how sex is genetically determined in human beings. (2)

117. Mendel blended his knowledge of Science and mathematics to keep the count of the individuals exhibiting a particular trait in each generation. He observed a number of contrasting visible characters controlled in pea plants in a field. He conducted many experiments to arrive at the laws of inheritance.

4

- i.** What are recessive traits? (1)
- ii.** What do the F_1 progeny of tall plants with round seeds and short plants with wrinkled seeds look like? (1)
- iii.** Mention the type of the new combinations of plants obtained in F_2 progeny along with their ratio, if F_1 progeny was allowed to self pollinate. (2)

OR

If 1600 plants were obtained in F_2 progeny, write the number of plants having traits:

- a.** Tall with round seeds
- b.** Short with wrinkled seeds Write the conclusion of the above experiment. (2)

118. The mechanism by which the sex of an individual is determined is called sex-determination. In human beings, sex of a newborn is genetically determined, whereas in some others it is not. There are 46 (23 pairs) chromosomes in human beings. Out of these, 44 (22 pairs) control the body characters and 2 (one pair) are known as sex chromosomes. The sex chromosomes are of two types - X chromosome and Y chromosome. At the time of fertilisation, depending upon which type of male gamete fuses with the female gamete, the sex of the newborn child is decided.

4

- i.** Why is a pair of sex chromosomes in human beings called a mismatched pair in terms of type and size? (1)
- ii.** Out of male or female, which of them has a perfect pair of sex chromosomes? In case of a perfect pair, will the gametes produced be of the same kind or of a different kind? (1)

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- iii.** Name two animals whose sex is not genetically determined. Explain the process of their sex determination. (2)

OR

With the help of a flowchart only, show how sex is genetically determined in human beings. (2)

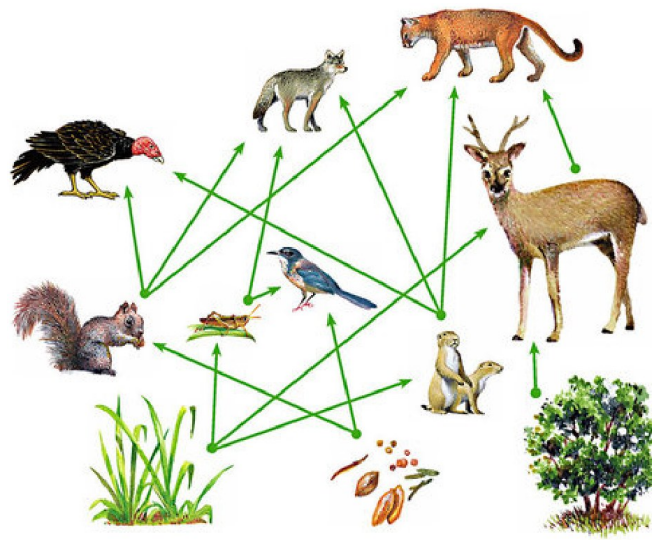
- 119.** Now a days chemical pesticides are excessively used to protect the crops from disease and pests. The chemical is washed down into the soil. From soil, these are absorbed by the plant along with water and minerals and from the water bodies. The human being occupies the top level in any food chain, the maximum chemical gets accumulated in their bodies. **4**

- i.** In the food chain consisting of grass, frog, bird, and insects, at which point will the concentration of harmful chemicals be highest? (1)
- ii.** At which level do pesticides enter the food chain? (1)
- iii.** What is biomagnification? (2)

OR

What role does a decomposer play in an ecosystem? (2)

- 120.** The food we eat acts as the fuel to provide energy to do work. The interaction among various components of environments involves the flow of energy from one component of the system to another. The green plant capture energy of sunlight and at each trophic level 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level. **4**



- i.** How much energy is captured by green plants from sunlight? (1)
- ii.** What is the direction of flow of energy in an ecosystem? (1)
- iii.** If the energy transferred to a tertiary consumer in a food chain is 10 J, how much energy was available to the primary consumer? (2)

OR

What is the 10 percent law of energy flow? (2)

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