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CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-6

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Time : 3 Hours   **Maximum Marks : 80**

General Instructions :
(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii)This question paper consists of a total of 30 questions.

Section A

1. Name the Physicist who discovered the magnetic effect of the electric current. [1]

Ans :

The name of Physicist is Oersted.

2. No two individuals are absolutely alike in a population. Why ? [1]

Ans :

Due to variations the differences between the parents and children as individual of the species are occurred. So no two individuals are absolutely alike in a population.

3. **Answer question numbers 3.1–3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

The human eye is like a camera. Its lens system forms an image on a light-sensitive screen called the retina. Light enters the eye through a thin membrane called the cornea. It forms the transparent bulge on the front surface of the eyeball as shown in the figure. The crystalline lens merely provides the finer adjustment of focal length required to focus objects at different distances on the retina. We find a structure called iris behind the cornea. Iris is a dark muscular diaphragm that controls the size of the pupil. The pupil regulates and controls the amount of light entering the eye.
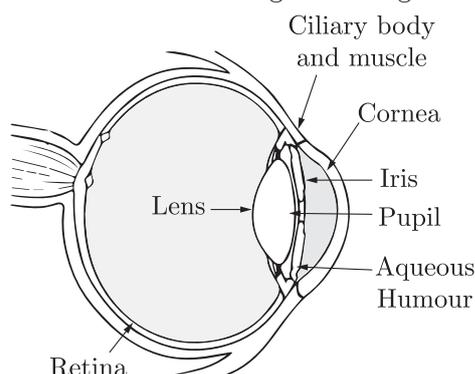

Fig: The Human Eye

There are mainly three common refractive defects of vision. These are (i) myopia or near-sightedness, (ii) hypermetropia or far-sightedness, and (iii) Presbyopia. These defects can be corrected by the use of suitable spherical lenses.

3.1 What is the function of pupil in the human eye? [1]

Ans : The pupil regulates and controls the amount of light.

3.2 What is the far point and near point of human eye with normal vision? [1]

Ans : The far point is infinity and near point is about 25 cm of the normal human eye.

3.3 A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? [1]

Ans : The student is suffering from short-sightedness or myopia.

3.4 What is the function of iris in human eye? [1]

Ans : Iris is a dark muscular diaphragm that controls the size of the pupil.

4. Given table provides the resistivity of conductors, alloy and insulators. Study the table and answer the following questions.

	Material	Resistivity ($\Omega\,\text{m}$)
Conductors	Silver	1.60×10^{-8}
	Copper	1.62×10^{-8}
	Aluminium	2.63×10^{-8}
	Tungsten	5.20×10^{-8}
	Nickel	6.84×10^{-8}
	Iron	10.0×10^{-8}
	Chromium	12.9×10^{-8}
	Mercury	94.0×10^{-8}
	Manganese	1.84×10^{-6}

	Material	Resistivity $(\Omega\,m)$
Alloys	Constantan (alloy of Cu and Ni)	49×10^{-6}
	Manganin (alloy of Cu, Mn and Ni)	44×10^{-6}
	Nichrome (alloy of Ni, Cr, Mn, and Fe)	100×10^{-6}
Insulators	Glass	$10^{10} - 10^{14}$
	Hard rubber	$10^{13} - 10^{16}$
	Ebonite	$10^{15} - 10^{17}$
	Diamond	$10^{12} - 10^{13}$
	Paper (dry)	10^{12}

4.1 Why among iron is a better conductor than mercury? [1]

Ans : Iron is a better conductor than mercury because the resistivity of iron $(= 10 \times 10^{-8}\,\Omega m)$ is less than the resistivity of mercury $(= 94 \times 10^{-8}\,\Omega\,m)$.

4.2 Which material is the best conductor? [1]

Ans : It can be observed from table that the resistivity of silver is the lowest among the listed materials. Hence, silver is the best conductor.

4.3 The copper and aluminium have [1]
(a) Low resistivity (b) high resistivity
(c) zero resistivity (d) high energy losses

Ans : (a) Low resistivity

4.4 Alloys are commonly used in electrical heating devices due to [1]
(a) Low resistivity as compare to all substance
(b) high resistivity as compare to metals
(c) Low resistivity as compare to metals
(d) None of these

Ans : (b) high resistivity as compare to metals

5. 2 ampere current is flowing through a conductor from a 10 volt emf source then resistance of conductor is [1]
(a) $20\,\Omega$ (b) $5\,\Omega$
(c) $12\,\Omega$ (d) $8\,\Omega$

Ans : (b) $5\,\Omega$

or

Three resistors of $4.0\,\Omega$, $6.0\,\Omega$ and $10.0\,\Omega$ are connected in series. What is their equivalent resistance [1]
(a) $20\,\Omega$ (b) $7.3\,\Omega$
(c) $6.0\,\Omega$ (d) $4.0\,\Omega$

Ans : (a) $20\,\Omega$

6. A student is to find the focal length of (i) a concave mirror (ii) convex lens by focussing the image of a distant object on a screen. He will observe that the screen is on the same side as that of the object in [1]
(a) both cases
(b) case (i) but not in case (ii)
(c) case (ii) but not in case
(d) neither case (i) nor in case (ii)

Ans : (b) case (i) but not in case (ii)

7. A student takes some zinc granules in a test tube and adds dil. HCl to it. He would observe that the colour of zinc granules changes to : [1]
(a) brown
(b) black
(c) yellow
(d) white

Ans : (b) black

8. Crystals of CH_3COOH, when dissolved in water will form : [1]
(a) weak acid
(b) weak base
(c) strong acid
(d) strong base

Ans : (a) weak acid

or

The pH value of a solution is in the range of 6 to 8. What is the colour developed when a student adds three drops of universal indicator in the solution? [1]
(a) Red (b) Blue
(c) Green (d) Orange

Ans : (c) Green

9. The part of the seed which is also known as embryonic leaf : [1]
(a) Embryo (b) Cotyledon
(c) Radicle (d) Plumule

Ans : (b) Cotyledon

10. Select the incorrect statement about budding : [1]
(a) A bud always arises from a particular region on a parent body
(b) A bud may arise from any part of the parent cell
(c) Before detaching from the parent body, a bud may form another bud
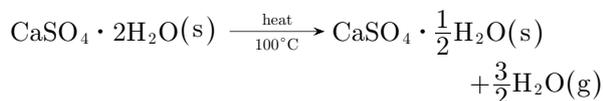(d) A bud may separate from the parent body and develops into a new individual

Ans : (b) A bud may arise from any part of the parent cell

11. To show experimentally that zinc is more reactive than copper, the correct procedure is to : [1]
(a) prepare copper sulphate solution and dip zinc strip into it
(b) prepare zinc sulphate solution and dip copper in it
(c) heat zinc and copper strip
(d) add dilute nitric acid on both the strips

Ans : (a) prepare copper sulphate solution and dip zinc strip into it

12. The positions of four elements X, Y, Z and P in the modern periodic table are shown below. Which of the following is the correct order of increasing electro-negativity of the elements? [1]

(a) $X < Y < Z < P$ (b) $Y < X < Z < P$

(c) $P < Z < Y < X$ (d) $Z < P < Y < X$

Ans : (c) $P < Z < Y < X$

Electro-negativity increase across a period and decreases down a group. Therefore, the correct order of electro-negativity of the elements is $P < Z < Y < X$.

or

Consider the following statements about bases.
I.   Bases have bitter taste and soapy touch,.
II. With carbon dioxide, they form salt and water.
III. The gas evolved with zinc metal extinguishes a lightning splinter. [1]

The correct statements (s) is/are:

(a) I and II   (b) II and III

(c) only I   (d) all of these

Ans : (a) I and II

Statement I and II are correct. Bases are better in taste and have a soapy touch.

Carbon dioxide is acidic in nature. So, it produces salt and water with the bases.

Hydrogen gas is evolved by the reaction of zinc with bases. This gas does not extinguish a lighting splinter.

(Q.no 13 to 14) In each of the following questions, a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as.

(a) If assertion is true and reason is correct explanation of assertion.

(b) If assertion is true but reason is false.

(c) If assertion is false but reason is true.

(d) If both are false.

13. **Assertion :** Halides (chloride, bromide and iodide) of silver are kept in dark brown or black bottle.

   Reason : The halides of silver on absorbing sunlight decompose to form silver metal and halogen. [1]

   Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. **Assertion :** The use of iodised salt is advisable.

   Reason : Iodine is essential for the synthesis of thyroxine hormone in thyroid gland. [1]

   Ans : (a) Assertion is true and reason is correct explanation of assertion.

Section B

15. i.   Name a metal for each case :

   (a) It does not react with cold as well as hot water but reacts with steam.

   (b) It does not react with any physical state of water.

   ii. When calcium metal is added to water the gas evolved does not catch fire but the same gas evolved on adding sodium metal to water catches fire. Why is it so ? [3]

   Ans :

   i.   (a) Iron (b) Copper

   ii. The gas evolved in case of calcium or sodium is hydrogen. In case of calcium the metal sinks in water and the hydrogen gas bubbles out of water. Thus, the heat of the reaction is not sufficient for the combustion of hydrogen.

   Sodium metal floats on the surface of water. The heat of the reaction is sufficient to ignite hydrogen and hence it catches fire.

16. The electronic configuration of an element 'X' is 2, 8, 8, 2. To which (a) period and (b) group of the modern periodic table does X' belong" ? State its valency. Justify your answer in each case. [3]

   Ans :

   Electronic configuration of X — 2, 8, 8, 2

   i.   As the atom X has 4 electron shells, thus, it belongs to the 4th period.

   ii. As the atom X has 2 electrons in the outermost shell, therefore, it belongs to the 2nd group. As the atom X has 2 electrons in the outermost shell, so its valency is 2.

   or

   Four elements P, Q, R and S have atomic numbers 12, 13, 14, and 15 respectively. Answer the following questions giving reasons :

   i.   What is the valency of Q ?

   ii. Classify these elements as metals and non-metals.

   iii. Which of these elements will form the most basic oxide ? [3]

   Ans :

   Electronic configuration of given elements are shown below :

   P–2,8,2
   Q–2,8,3
   R–2,8,4
   S–2,8,5

   i.   As the atom Q has 3 electrons in its outermost shell, so its valency is 3.

   ii. The elements which donate 1 to 3 electrons from their valence shell are metals. Elements. P and Q have 2 and 3 electrons in their valence shells respectively, so, these are metals. But elements which share or accept 4 to 1 electrons in their valence shell are non-metals R and S elements have 4 and 5 electrons in their valence shell respectively, so, these are non-metals.

   iii. Element P will form the most basic oxide, because it has least electrons 2 in its valence shell among all the four elements.

17. A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound. Write the chemical equation for its preparation. For what purpose is it used in hospitals ? [3]

   Ans :

   The compound is Plaster of Paris.

   Plaster of Paris is prepared from naturally occurring gypsum.

$$CaSO_4 \cdot 2H_2O(s) \xrightarrow[100°C]{heat} CaSO_4 \cdot \frac{1}{2}H_2O(s)$$
$$+ \frac{3}{2}H_2O(g)$$

Plaster of Paris is used in hospitals for plastering fractured bones to set them at the right place in fixed position.

18. Explain with the help of suitable examples why certain traits cannot be passed on to the next generation. What are such traits called ? [3]

Ans :

The traits which people acquire during their lives, like knowledge and skills due to some special efforts, use or disuse of organs and due to some environmental factors. These traits cannot be passed on to the next generations, called acquired traits. It can be understood with the help of some examples such as—

If a group of mice having tail will breed, their progeny will also have the same type of tail but if the tail of all the mice is removed by surgery in each generation, no tailless mouse will be produced even after a few generations. It is because the removal of tail is a physical change which could not make a change in the gene responsible for the presence of tail in mice.

or

A cross was carried out between a pure bred tall pea plant and a pure bred dwarf pea plant and F_1 progeny was obtained. Later, the F_1 progeny was selfed to obtain, F_2 progeny. Answer the following questions.
i. What is the phenotype of the F_1 progeny and why?
ii. Give the phenotype ratio of the F_2 progeny.
iii. Why is the F_2 progeny different from the F_1 progeny ? [3]

Ans :

i. The first generation of F_1 progeny formed are all tall due to dominant characters.
ii. The F_2 generation has tall pea plants and dwarf pea plants in the ratio of 3:1.
iii. The F_2, progeny of the F_1 tall plants are not all tall, some are dwarf. There were no plants with intermediate height in between tall and dwarf plants. Thus, the traits are inherited independently.

19. How are the fats digested in our bodies ? Where does this process take place ? [3]

Ans :

The small intestine is the site of the complete digestion of fats. It receives the secretions of the liver and pancreas for this purpose. Fats are present in the intestine in the form of large globules. Bile salts break them down into smaller globules increasing the efficiency of enzyme action. The pancreas secretes pancreatic juice which contains enzyme lipase for breaking down emulsified fats. The wall of the small intestine contain glands which secrete intestinal juice. The enzyme present in it finally convert the fats into fatty acids and glycerol.

20. (i) Why fertilisation is only possible, if copulation takes place during the middle of menstrual cycle? Also, name the process which gets temporarily stopped, when a woman gets pregnant.
(ii) Prenatal sex-determination has been banned in India. Comment. [3]

Ans :

(i) As ovulation occurs on the 14th day of the menstrual cycle, sperms have greater chances during this period to fertilise the egg or ovum. After fertilisation, the process of menstruation does not occur as during pregnancy the thick uterine wall, which would get sloughed off during the menstrual cycle, is now being used for nourishment, growth and development of fertilised ovum.
(ii) The male-female sex ratio is rapidly declining in the Indian society due to the practise of female foeticide. Thus, to avoid this, prenatal sex-determination has been banned in India.

21. Calculate the amount of charge that would flow in one hour through the element of an electric iron drawing a current of 0.4 A. [3]

Ans :

Current, $(I) = 0.4$ A

Time $(t) = 1$ hour $= 3600$ s

Electric charge, $(Q) = I \times t = 0.4 \times 3600 = 1440$ C

22. i. What is the total resistance of n resistors each of resistance 'R' connected in: (a) series ? (b) parallel?
ii. Calculate the resultant resistance of 3 resistors $3\,\Omega, 4\,\Omega$ and $12\,\Omega$ connected in parallel. [3]

Ans :

i. In series combination
$$R_S = R_1 + R_2 + ...R_n$$
$$R_S = R + R.....n \text{ times}$$
$$R_S = nR$$
In parallel combination:
$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + ...\frac{1}{R_n}$$
$$\frac{1}{R_P} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R} + ... + n \text{ times}$$
$$\frac{1}{R_P} = \frac{1 + 1 + ...n \text{ times}}{R}$$
$$\frac{1}{R_P} = \frac{n}{R}$$
$$R_P = \frac{R}{n}$$

ii. Given:
$$R_1 = 3\,\Omega$$
$$R_2 = 4\,\Omega$$
$$R_3 = 12\,\Omega$$
$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{3} + \frac{1}{4} + \frac{1}{12}$$
$$= \frac{4 + 3 + 1}{12}$$
$$R = \frac{12}{8}\,\Omega = \frac{3}{2}\,\Omega$$
$$= 1.5\,\Omega$$

23. Why does the pH of the mouth change after taking meals ? What harm is associated with it and how can it be overcome ?   [3]

Ans :

Normally the pH in the mouth is more than 7 as the saliva produced by the salivary glands is basic in nature. However, after meals some food particles continue sticking to the teeth and other parts of the mouth. These food particles rapidly decay due to bacterial action to produce acids and hence the pH within the mouth cavity decreases.

If the pH falls below 5.5 then the enamel on the teeth gets corroded, thereby, causing tooth cavities. The best way to avoid tooth cavities is to brush teeth with some toothpaste. All toothpastes contain some basic substances which neutralise acids.

24. An object placed on a metre scale at 8 cm mark was focused on a white screen placed at 92 cm mark, using a converging lens placed on the scale at 50 cm mark.   [3]
i.   Find the focal length of the converging lens.
ii. Find the position of the image formed if the object is shifted towards the lens at a position. of 29.0 cm.
iii. State the nature of the image formed if the object is further shifted towards the lens.

Ans :

Given,   Position of object $= 8$ cm mark

Position of screen $= 92$ cm mark

Position of converging lens $= 50$ cm mark

$$u = (8 - 50) \text{ cm} = -42 \text{ cm}$$

$$v = 92 - 50 = 42 \text{ cm}$$

i. $$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{42} - \left(-\frac{1}{42}\right)$$

$$= \frac{1}{42} + \frac{1}{42} = \frac{2}{42} = \frac{1}{21}$$

$$f = 21 \text{ cm}$$

Thus, focal length of converging lens $= 21$ cm

ii.   Now, position of object $= 29$ cm

$$u = (29 - 50) \text{ cm} = -21 \text{ cm}$$

$$f = 21 \text{ cm}$$

Again, $$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{21} = \frac{1}{v} - \left(-\frac{1}{21}\right)$$

$$\frac{1}{v} = \frac{1}{21} - \frac{1}{21} = \frac{0}{21}$$

$$v = \frac{21}{0} = \infty$$

iii. The image formed on the same side as the object and is highly enlarged, virtual and erect.

or

When and where do we see a rainbow? How is a rainbow formed? Draw a labelled diagram to illustrate the formation of a rainbow   [3]

Ans :

Rainbow is always formed in the direction opposite to that of the sun, just after the rain. The rainbow is produced due to the raindrop dispersion of sunlight by tiny droplets of water suspended in air, just after rain.

The suspended tiny droplets of water act as innumerable small prisms. When the sunlight is incident on the side A of the tiny droplet of water, it gets refracted as well as dispersed. The dispersed rays on striking the surface B of the tiny water drop suffer total internal reflection, and hence, moves on towards surface A.

At the surface A, the rays further suffer refraction and emerge out as the band of colours in the form of a circular arc along the horizon. The red colour appears on the upper arc of rainbow and violet colour on the innermost arc.

You can also see rainbow on a bright sunny day, in the mist created by a waterfall or a water fountain.

Section C

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.
i.   Where in the periodic table are elements X and Y placed ?
ii. Classify X and Y as metal (s), non-metal(s) or metalloid(s)
iii. What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.
iv. Draw the electron dot structure of the divalent halide.   [5]

Ans :

i.   X belongs to Group 17 and 3rd period.
     Y belongs to Group 2 and 4th period.
ii. X–Non-metal, Y–Metal
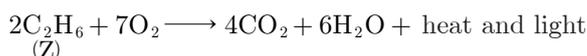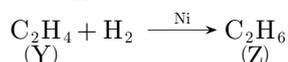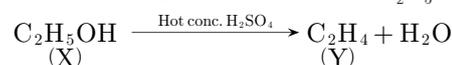iii. Basic oxide; Ionic bonding
iv.
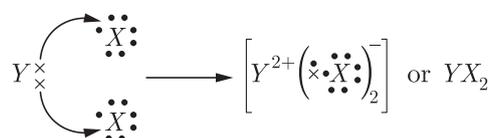
or

An organic compound 'X' on heating with conc. H_2SO_4 forms a compound 'Y' which on addition of one molecule of hydrogen in the presence of nickel forms a compound 'Z'. One molecule of compound 'Z' on combustion forms two molecules of CO2 and three molecules of H_2O. Identify giving reasons the compounds 'X', 'Y' and 'Z'. Write the chemical equations for all the chemical reactions involved.   [5]
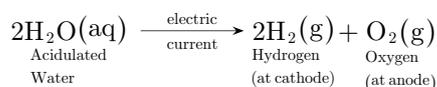
Ans :

Since compound Z gives 2 molecules of CO_2 and 3 molecules of H_2O, it shows that it has the molecular formula C_2H_6 (ethane). Z is obtained by the addition of one molecule of hydrogen to compound Y so the molecular formula of Y should be C_2H_4 (ethene). Compound Y is obtained by heating compound X with concentrated H_2SO_4 which shows it to be an alcohol. So compound X could be C_2H_5OH (ethanol).

$$\underset{(X)}{C_2H_5OH} \xrightarrow{\text{Hot conc. } H_2SO_4} \underset{(Y)}{C_2H_4 + H_2O}$$

$$\underset{(Y)}{C_2H_4 + H_2} \xrightarrow{Ni} \underset{(Z)}{C_2H_6}$$

$$\underset{(Z)}{2C_2H_6 + 7O_2} \longrightarrow 4CO_2 + 6H_2O + \text{heat and light}$$

26. i. State your observations when electric current is passed through acidulated water contained in a voltmeter, such that each electrode has been covered by a test tube containing water.

ii. How will you test the gas evolved?

iii. Write an electrochemical equation for the reaction. [5]

Ans :

i. (a) Tiny bubbles of a colourless gas is formed on each electrode.

    (b) These bubbles of colourless gas rise up in the test tubes. They collect in the form of colourless gases and in doing so displaces the water in the downward direction.

    (c) The volume of gas collected at cathode is twice the volume of gas collected at anode.

ii. The gas which collects at the cathode is hydrogen. It can be tested as follows:

    (a) Light a candle. Lift the test tube in the inverted position from the cathode and bring its mouth near the flame of the candle. You will observe that the gas burns with a "pop" sound and the candle goes off. This is a test for hydrogen gas.

    (b) Take a glowing wooden splint. Lift the test tube in inverted position from the anode and introduce the glowing splint in it. You will observe that the splint bursts into flame. This is a test for oxygen.

iii. The electrochemical reactions can be expressed as follows :

$$\underset{\substack{\text{Acidulated} \\ \text{Water}}}{2H_2O(aq)} \xrightarrow{\substack{\text{electric} \\ \text{current}}} \underset{\substack{\text{Hydrogen} \\ \text{(at cathode)}}}{2H_2(g)} + \underset{\substack{\text{Oxygen} \\ \text{(at anode)}}}{O_2(g)}$$

27. i. Draw a diagram of the Human Alimentary Canal and label on it:
Oesophagus, Gall bladder, Liver and Pancreas.

ii. Explain the statement, 'Bile does not contain any enzyme but it is essential for digestion.' [5]

Ans :

i.
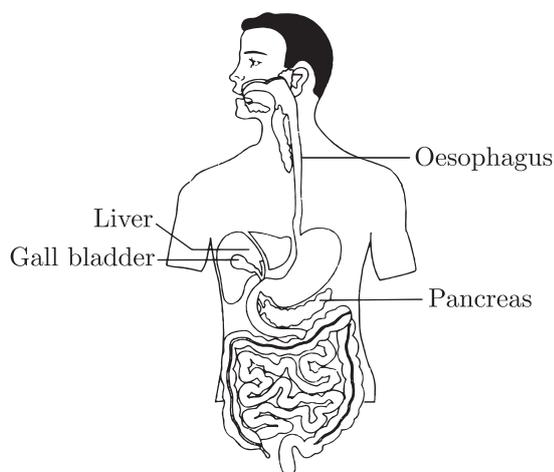
Human Alimentary canal

ii. (a) Bile does not contain any enzyme but it contains sodium salt and pigments.

    (b) Bile emulsifies fats and makes it easy for the enzymes to act on it.

   (c) Bile is alkaline and it makes the acidic food coming from the stomach alkaline so that pancreatic enzymes can act on it.

28. What is pollination? How does it occur in plants? How does pollination lead to fertilization? Explain.[5]

Ans :

**Pollination:** Transfer of pollen grains from anther to stigma is called pollination. It is of two types.

i. **Self Pollination :** The transference of pollen grains from the anther of a flower to the stigma of the same flower or of another flower born on the same plant is called self pollination.

ii. **Cross pollination :** The transference of pollen grains from anther of a flower of one plant to the stigma a flower of another plant of the same species is called cross pollination. As the pollen grains are not capable of locomotion, they have to depend on various agents for transmission. These agents are wind, water or animals.
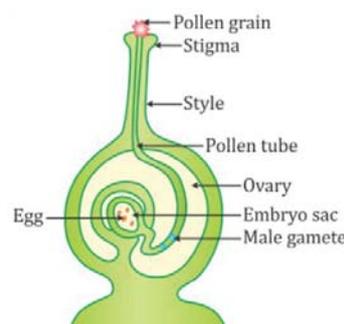
Then pollination leads to fertilisation. After the pollen grains are deposited on the stigma, the pollen grains absorb water and sugar from the surface of stigma and swell up. A tube grows out of the pollen grain and travel through the style to reach the ovary. The pollen tube carrying two male gametes which liberated inside the embryo sac. One male gamete fuses with the egg to form zygote. The other male gamete fuses with secondary nucleus to form the endosperm, which provides nourishment to the growing embroyo.

or

i. Name the parts labelled A, B, C , D and E.

ii. Where do the following functions occur ?
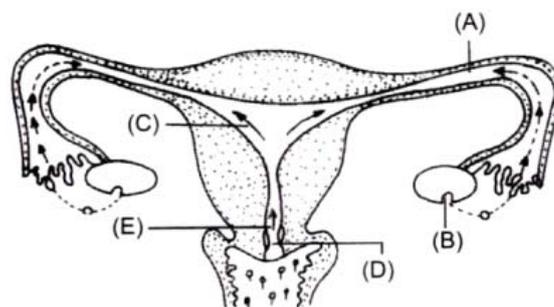
    (a) Production of an egg

    (b) Fertilisation

    (c) Implantation of zygote

iii. What happens to the lining of uterus;

    (a) before release of a fertilized egg ?

    (b) if no fertilisation occur ? [5]

Ans :

i. A — Oviduct or fallopian tube

    B — Ovary

    C — Uterus

D — Cervix
E — Vagina
ii. (a) Ovary
(b) Fallopian tube
(c) Uterus
iii.
(a) In human female, before release of fertilised egg uterus prepares itself every month to receive and nurture the growing embryo. The lining of uterus thickens and is richly supplied with blood to nourish the growing embryo.
(b) If fertilisation does not occur, the lining is not required any more. Hence, the thickened lining of the uterus breaks down along with blood vessels. The degenerated part of uterus along with the blood moves out of the vagina in the form of bleeding, is called menstruation.

29. i. To construct a ray diagram we use two light rays which are so chosen that it is easy to know their directions after reflection from the mirror. List these two rays and state the path of these rays after reflection. Use these two rays to locate the image of an object placed between infinity and the centre of curvature of a concave mirror

ii. Draw a ray diagram to show the formation of image of an object placed between the pole and principal focus of a concave mirror. How will the nature and size of the image formed change, if the mirror is replaced by a converging lens of same focal length ?   [5]

Ans :

i. To construct a ray diagram we use two light rays:
(a) A ray of light parallel to principal axis of a concave mirror, after reflection it passes through the principal focus of the concave mirror.
(b) A ray of light which passes through the centre of curvature of a concave mirror, after reflection it retraces its path.
To locate the image of an object placed between infinity and the centre of curvature of a concave mirror:
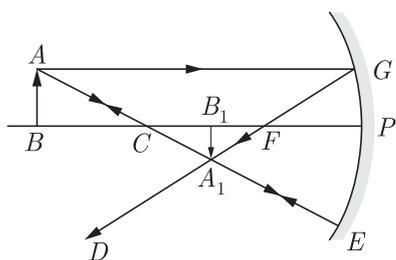
AB is an object situated between infinity and the centre of curvature of the concave mirror. A ray of light starting from point A, moving parallel to the principal axis of the concave mirror along AG after reflection passes through the point F and moves along GD. Another ray starting from the point A along AC, strikes the mirror at point E retraces its path. Thus, the divergent beams starting from point A, on striking the mirror at points G and E, after reflection, converge at point A1, thereby forming an image $A_1 B_1$. This image is between the centre of curvature (C) and

focal point (F), in front of concave mirror. The image is real, inverted and diminished.

ii. A ray diagram to show the formation of image of an object placed between the pole and principal focus of a concave mirror.
$A_1 B_1$ is the image of the object AB which is formed behind the concave mirror. The image is virtual, erect and magnified.
If the mirror is replaced by a converging lens of same focal length then image formed on the same side as the object. The image is virtual, erect and enlarged.

30. i. What is a solenoid ? Draw a sketch of the pattern of the field lines of the magnetic field through and around a current carrying solenoid.
ii. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop.   [5]

Ans :

i. An insulated copper wire wound on some cylindrical cardboard or plastic tube, such that its length is greater than its diameter and it behaves like a magnet when a current is made to flow through it, is called a solenoid.
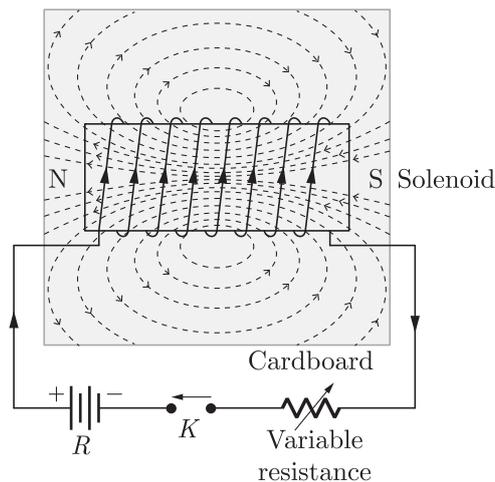
ii. The magnetic field inside the circular loop is perpendicular to the table top and goes in the downward direction.
The magnetic field outside the circular loop is perpendicular to the table and goes in the upward direction.
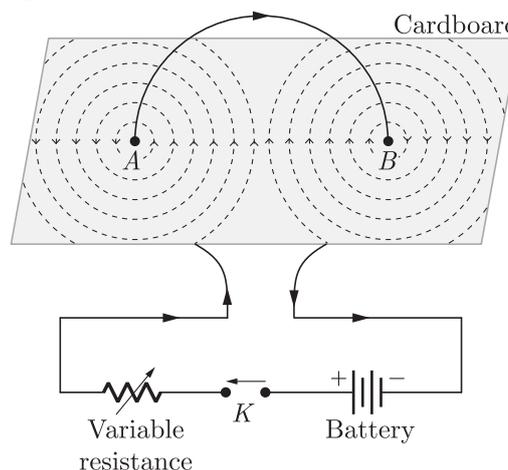
or

When two resistors of resistances R_1 and R_2 are connected in parallel, the net resistance is $3\ \Omega$. When connected in series, its value is $16\ \Omega$. Calculate the values of R_1 and R_2.   [5]

Ans :

R_1 and R_2 are in parallel combination.

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{R_1 \times R_2}{R_1 + R_2} = 3 \qquad\qquad ...(1)$$

When R_1 and R_2 are in series combination.

$$R_s = R_1 + R_2 = 16\ \Omega$$

$$R_1 + R_2 = 16 \qquad\qquad ...(2)$$

After solving equation (1) and equation (2),We get

$$R_1^2 - 16R_1 + 48 = 0$$

$$(R_1 - 4)(R_1 - 12) = 0$$

$$R_1 = 4\ \Omega, 12\ \Omega$$

$$R_2 = 12\ \Omega \text{ or } 4\ \Omega$$

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