

Class : 10

Register
Number

COMMON QUARTERLY EXAMINATION - 2023-24

Time Allowed : 3.00 Hours]

SCIENCE

[Max. Marks : 75

PART - 1

Choose the correct answer.

12x1=12

- The unit of g is ms^{-2} . It can be expressed as
a) cms^{-1} b) $N\ kg^{-1}$ c) Nm^2kg^{-1} d) cm^2s^{-2}
- The focal length of a lens is $-0.25m$, then its power is
a) $-4D$ b) $2.5D$ c) $-40D$ d) $-2D$
- Temperature is the average ----- of the molecules of a substance.
a) Difference in K.E and P.E b) Sum of P.E and K.E
c) Difference in the T.E and P.E d) Difference in K.E and T.E
- The unit of conductance is
a) mho b) joule c) ohm d) ohm metre
- 1 mole of any substance contains ----- molecules.
a) 6.023×10^{23} b) 6.023×10^{-23} c) 3.0115×10^{23} d) 12.046×10^{23}
- Neon shows Zero electron affinity due to
a) Stable arrangement of neutrons b) Stable configuration of electrons
c) Reduced size d) Increased density
- Which of the following is the universal solvent?
a) Acetone b) Benzene c) Water d) Alcohol
- Oxygen is produced at what point during photosynthesis?
a) When ATP is converted to ADP b) When CO_2 is fixed
c) When H_2O is split d) All of these
- Rabbits do not have
a) Canines b) Incisors c) Premolars d) Molars.
- Which one of the following regarding blood composition is correct?
a) Plasma = Blood + Lymphocyte b) Serum = Blood + Fibrinogen
c) Lymph = Plasma + RBC + WBC d) Blood = Plasma + RBC + WBC + Platelets
- Identify the exocrine gland
a) Pituitary gland b) Adrenal gland c) Salivary gland d) Thyroid gland
- The large elongated cells that provide nutrition to developing sperms are
a) Primary germ cells b) Sertoli cells c) Leydig cells d) Spermatogonia

Part - II

Answer any seven questions. Q.No. 22 is compulsory.

7x2=14

- State the principle of moments.
- State Boyle's law.
- Give any two examples for heterodi atomic molecules.
- Say true or false, If false give the correct statement.
i) Moseley's periodic table is based on atomic mass.
ii) An alloy is a heterogenous mixture of metals.
- What is respiratory quotient?
- What are heart sounds? How are they produced?

CH / 10 / Sci / 1

19. Match the following.

- A. Nissil's granules - 1) Forebrain
B. Hypothalamus - 2) Peripheral Nervous system
C. Cerebellum - 3) Cyton
D. Schwann cell - 4) Hind brain

20. Why are thyroid Hormones referred as personality hormone?

21. Fill in:

- a) The pairs of contrasting character of Mendel are called -----
b) Down's syndrome is the genetic condition with ----- chromosomes.

22. 3.5 litres of ethanol is present in 15 litres of aqueous solution of ethanol. Calculate the volume percent of ethanol solution.

PART – III

Answer any seven questions .Q.No: 32 is compulsory.

7x4 = 28

23. Differentiate the eye defects Myopia and Hypermetropia.

24. Derive the ideal gas equation.

25. a) Name the acid that renders aluminium passive. Why?

b) Identify the bond between H and F in HF molecule.

c) What property forms the basis of identification?

26. In what way hygroscopic substances differ from deliquescent substances. Give examples.

27. a) Write the dental formula of rabbit.

b) How does leech suck blood from the host?

28. Enumerate the functions of blood.

29. a) Draw a neat labelled diagram of a neuron.

b) Differentiate between voluntary and involuntary actions.

30. Write the physiological effects of gibberellins.

31. a) Name the secondary sex organs in male.

b) Draw the structure of human sperm and mark the parts.

32. A piece of wire of resistance 10Ω is drawn out so that its length is increased to three times its original length. Calculate the new resistance.

PART-IV

Answer all the questions in detail.

3x7=21

33. a) State Newton's laws of motion.

(OR)

b) With the help of a circuit diagram derive the formula for the resultant resistance of three resistance connected in (i) series and (ii) parallel.

34. a) Give the salient features of modern atomic theory.

(OR)

b) Write notes on various factors affecting solubility.

35. a) The sex of the new born child is a matter of chance and neither of parents may be considered responsible for it. What would be the possible fusion of gametes to determine the sex of the child? Explain.

(OR)

b) Write the events involved in the sexual reproduction of a flowering plant.

i) Discuss the first event and write the types.

ii) Mention the advantages and the disadvantages of that plant.

COMMON QUARTERLY EXAMINATION 2023-24
(Chennai District)
Class 10 – SCIENCE
ANSWER KEY

PART - I

1	b) N kg^{-1}	7	c) Water
2	a) -4D	8	c) When H_2O is splitted
3	c) Difference in the T.E and P.E	9	a) Canines
4	a) mho	10	d) Blood = Plasma+RBC+WBC+Platelets
5	a) 6.023×10^{23}	11	c) Salivary gland
6	b) Stable configuration of electrons	12	c) Sertoli cells

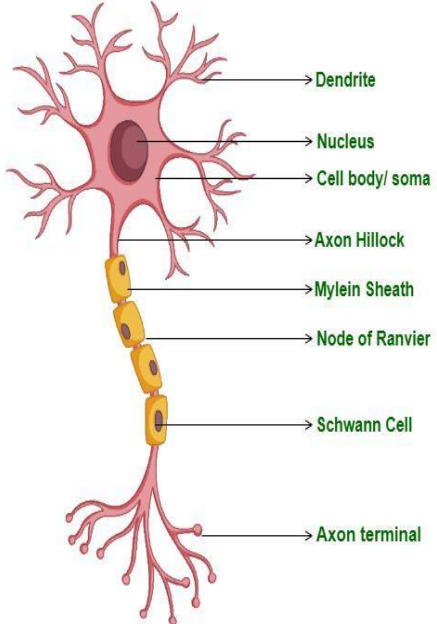
PART – II

13	When a number of like or unlike parallel forces act on a rigid body and the body is in equilibrium then the algebraic sum of the moments in the clockwise direction is equal to the algebraic sum of the moments in the anti-clockwise direction. Moment in clockwise direction = Moment in anti-clockwise direction $F_1 \times d_1 = F_2 \times d_2$
14	Boyle's law: When the temperature of a gas is kept constant, the volume of a fixed mass of gas is inversely proportional to its pressure. $P \propto 1/V$
15	1. Hydrogen Chloride (HCl) 2. Carbon monoxide (CO)
16	(i) False Correct statement: Moseley's periodic table is based on atomic number (ii) False Correct statement: An alloy is homogeneous mixture of metals.
17	Respiratory quotient (R.Q): Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as $RQ = \frac{\text{Volume of CO}_2 \text{ liberated}}{\text{Volume of O}_2 \text{ consumed}}$
18	Heart Sound: The rhythmic closure and opening of the valves cause the sound of the heart. The first sound LUBB is of longer duration and is produced by the closure of the tricuspid and bicuspid valves after the beginning of ventricular systole. The second sound DUBB is of a shorter duration and produced by the closure of semilunar valves at the end of ventricular systole.
19	A. Nissl's granules Cytosol B. Hypothalamus Forebrain C. Cerebellum Hindbrain D. Schwann cell -Peripheral Nervous system
20	Essential for normal physical, mental and personality development. α It is also known as personality hormone
21	a) Alleles b) Chromosome 21 (Trisomy 21)
22	Given: Volume of aqueous solution of ethanol = 15 litres & Volume of ethanol = 3.5 litres. $\text{Volume of percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solution}} \times 100 = \frac{3.5}{15} \times 100 = 23.33 \%$

PART – III

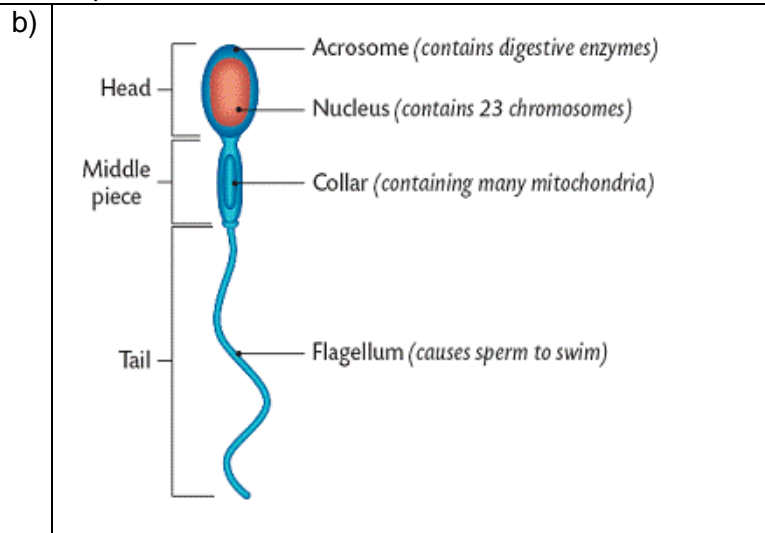
23	Myopia		Hypermeteropia
	1 It is also known as short sightedness.	1	It is also known as long sightedness.
	2 It occurs due to the lengthening of eye ball.	2	It occurs due to the shortening of eye ball.
	3 Distant objects cannot be seen clearly.	3	Nearby objects cannot be seen clearly.
	4 The focal length of eye lens is reduced.	4	The focal length of eye lens is increased.
	5 The distance between eye lens and retina increases.	5	The distance between eye lens and retina decreases.
	6 The far point has come closer.	6	The near point has moved farther.
	7 The images of distant objects are formed before the retina.	7	The images of nearby object are formed behind the retina.
	8 It can be corrected using concave lens	8	It can be corrected using convex lens.

24	<p>Ideal Gas Equation</p> <p>The ideal gas equation is an equation, which relates all the properties of an ideal gas. An ideal gas obeys Boyle's law and Charles' law and Avogadro's law. According to Boyle's law $PV = \text{constant}$ (3.1)</p> <p>According to Charles's law, $V/T = \text{constant}$ (3.2)</p> <p>According to Avogadro's law, $V/n = \text{constant}$ (3.3)</p> <p>After combining equations (3.1), (3.2) and (3.3), you can get the following equation. $PV/nT = \text{constant}$ (3.4)</p> <p>The above relation is called the combined law of gases. If you consider a gas, which contains μ moles of the gas, the number of atoms contained will be equal to μ times the Avogadro number, N_A. i.e. $n = \mu N_A$. (3.5)</p> <p>Using equation (3.5), equation (3.4) can be written as $PV/\mu N_A T = \text{constant}$</p> <p>The value of the constant in the above equation is taken to be k_B, which is called as Boltzmann constant ($1.38 \times 10^{-23} \text{ JK}^{-1}$). Hence, we have the following equation: $PV/\mu N_A T = k_B$ $PV = \mu N_A k_B T$ Here, $\mu N_A k_B = R$, which is termed as universal gas constant whose value is $8.31 \text{ J mol}^{-1} \text{ K}^{-1}$. $PV = RT$ (3.6)</p> <p>Ideal gas equation is also called as equation of state because it gives the relation between the state variables and it is used to describe the state of any gas.</p>
25	<p>a) Dilute and concentrated nitric acid renders aluminium passive. It is because nitric acid forms an acid film on the surface of aluminium.</p> <p>b) Ionic Bond.</p> <p>c) Electronegativity.</p>

26	Hygroscopic substances		Deliquescence substances	
	When exposed to the atmosphere at ordinary temperature, they absorb moisture and do not dissolve.		When exposed to the atmospheric air at ordinary temperature, they absorb moisture and dissolve.	
	Hygroscopic substances do not change its physical state on exposure to air.		Hygroscopic substances do not change its physical state on exposure to air.	
	Hygroscopic substances may be amorphous solids or liquids.		Deliquescent substances are crystalline solids.	
	Examples: 1. Conc.Sulphuric acid (H ₂ SO ₄). 2. Phosphorus Pentoxide (P ₂ O ₅). 3. Quick lime (CaO). 4. Silica gel (SiO ₂).		Examples: Caustic soda (NaOH), Caustic potash (KOH) and Ferric chloride (FeCl ₃).	
27	<p>a) Dental formula is (I $\frac{2}{1}$, C $\frac{0}{0}$, PM. $\frac{3}{2}$, M $\frac{3}{3}$.) in rabbit which is written as $\frac{2033}{1023}$.</p> <p>b) The leech makes a triradiate or Y shaped incision in the skin of the host by the jaws protruded through the mouth. The blood is sucked by muscular pharynx and the salivary secretions are poured.</p>			
28	<p>Functions of blood</p> <p>i) Transport of respiratory gases (Oxygen and CO₂).</p> <p>ii) Transport of digested food materials to the different body cells.</p> <p>iii) Transport of hormones.</p> <p>iv) Transport of nitrogenous excretory products like ammonia, urea and uric acid.</p> <p>v) It is involved in protection of the body and defense against diseases.</p> <p>vi) It acts as buffer and also helps in regulation of pH and body temperature.</p> <p>vii) It maintains proper water balance in the body.</p>			
29	a)			
	b)	Voluntary Actions		Involuntary Actions
	These actions are in our control.		These actions are not in our control.	
	It is controlled by brain.		It is controlled by Hind brain and the spinal cord.	
	It controls slow process		They are very fast without thinking	
	They can be regulated by muscles of the body.		They can be regulated by muscles or glands.	
	Example: Walking, Running		Example: Breathing, Heartbeat	

- 30 Physiological effects of gibberellins
1. Application of gibberellins on plants stimulates extraordinary elongation of internode. e.g. Corn and Pea.
 2. Treatment of rosette plants with gibberellin induces sudden shoot elongation followed by flowering. This is called bolting
 3. Gibberellins promote the production of male flowers in monoecious plants (Cucurbits)
 4. Gibberellins break dormancy of potato tubers.
 5. Gibberellins are efficient than auxins in inducing the formation of seedless fruit - Parthenocarpic fruits (Development of fruits without fertilization) e.g. Tomato.

- 31 a) Secondary Sex Organs - Male: Vas deferens, epididymis, seminal vesicle, prostate gland and penis.



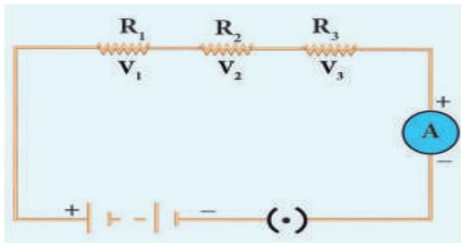
- 32 Resistance (R) = 10 ohms
 Original length = L
 Increase in length = 3L
 Resistance (R) = $\frac{\rho L}{A}$
 Hence length will increase three times and its breadth area will decrease 3 times.
 $A = \frac{A}{3}$
 New resistance $R_n = \frac{\rho \cdot 3L}{\frac{A}{3}}$
 $R_n = 9 \times R$
 $= 9 \times 10 = 90 \text{ ohms}$

PART – IV

- 33 a) Newton's First Law: This law states that every body continues to be in its state of rest or the state of uniform motion along a straight line unless it is acted upon by some external force.
- NEWTON'S SECOND LAW OF MOTION : According to this law, "the force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force".
- NEWTON'S THIRD LAW OF MOTION Newton's third law states that 'for every action, there is an equal and opposite reaction. They always act on two different bodies

b)

(i) Resistors in series



Series connection of resistors

- 1) Let, three resistances R_1 , R_2 and R_3 be connected in series (Refer Figure). Let the current flowing through them be I .
- 2) According to Ohm's Law, the potential differences V_1 , V_2 and V_3 across R_1 , R_2 and R_3 respectively, are given by:

$$V_1 = I R_1 \text{ ----- (1)}$$

$$V_2 = I R_2 \text{ ----- (2)}$$

$$V_3 = I R_3 \text{ ----- (3)}$$

The sum of the potential differences across the ends of each series or is given by:

$$V = V_1 + V_2 + V_3 \text{ Using equations (1), (2) and (3), we get}$$

$$V = I R_1 + I R_2 + I R_3 \text{ ----- (4)}$$

- 3) The effective resistor is a single resistor, which can replace the resistors effectively, so as to allow the same current through the electric circuit

- 4) Let, the effective resistance of the series-combination of the resistors be R_S . Then,

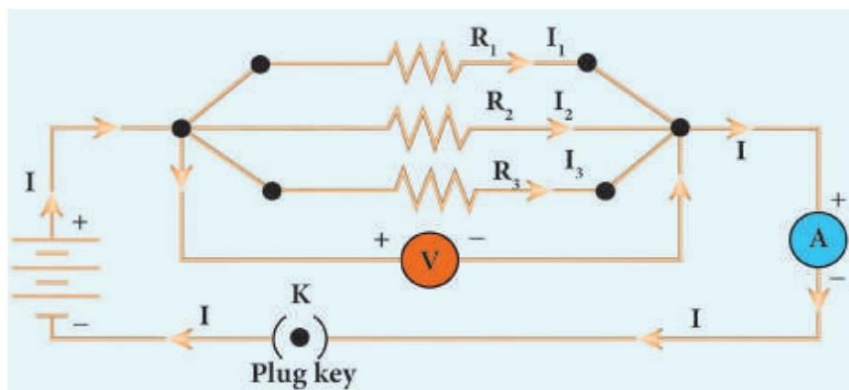
$$V = I R_S \text{ -----(5) Combining equations (4) and (5), you get,}$$

$$I R_S = I R_1 + I R_2 + I R_3$$

$$R_S = R_1 + R_2 + R_3 \text{ ----- (6)}$$

- 5) When a number of resistors are connected in series, their equivalent resistance or effective resistance is equal to the sum of the individual resistances.
- 6) When 'n' resistors of equal resistance R are connected in series, the equivalent resistance is 'n R'.
i.e., $R_S = n R$
- 7) The equivalent resistance in a series combination is greater than the highest of the individual resistances.

(ii) Resistors in Parallel



Parallel connections of resistors

- 1) Consider that three resistors R_1 , R_2 and R_3 are connected across two common points A and B.
- 2) The current I arriving at A divides into three branches I_1 , I_2 and I_3 passing through R_1 , R_2 and R_3 respectively

3) According to the Ohm's law, you have, $I_1 = \frac{V}{R_1}$ ----- (1)

$$I_2 = \frac{V}{R_2} \text{ ----- (2)}$$

$$I_3 = \frac{V}{R_3} \text{ ----- (3)}$$

The total current through the circuit is given by

$I = I_1 + I_2 + I_3$ Using equations (1), (2) and (3), you get

$$I = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} \text{ ----- (4)}$$

- 4) Let the effective resistance of the parallel combination of resistors be R_p . Then,

$$I = \frac{V}{R_p} \text{ ----- (5)}$$

Combining equations (4) and (5), you have

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \text{ ----- (6)}$$

- 5) when a number of resistors are connected in parallel, the sum of the reciprocals of the individual resistances is equal to the reciprocal of the effective or equivalent resistance.

- 6) When 'n' resistors of equal resistances R are connected in parallel, the equivalent resistance is $\frac{R}{n}$.

$$\text{Hence, } R_p = \frac{R}{n}$$

- 7) The equivalent resistance in parallel combination is less than the lowest of the individual resistances

34) The main postulates of modern atomic theory are as follows:

- a)
 - 1) An atom is no longer indivisible (after the discovery of the electron, proton, and neutron)
 - 2) Atoms of the same element may have different atomic mass. (Discovery of isotopes $_{17}\text{Cl}^{35}$, $_{17}\text{Cl}^{37}$).
 - 3) Atoms of different elements may have same atomic masses (discovery of Isobars $_{18}\text{Ar}^{40}$, $_{20}\text{Ca}^{40}$).
 - 4) Atoms of one element can be transmuted into atoms of other elements. In other words, atom is no longer indestructible (discovery of artificial transmutation).
 - 5) Atoms may not always combine in a simple whole number ratio (E.g. Glucose $\text{C}_6\text{H}_{12}\text{O}_6$ C:H:O = 6:12:6 or 1:2:1 and Sucrose $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ C:H:O = 12:22:11).
 - 6) Atom is the smallest particle that takes part in a chemical reaction.
 - 7) The mass of an atom can be converted into energy ($E = mc^2$).

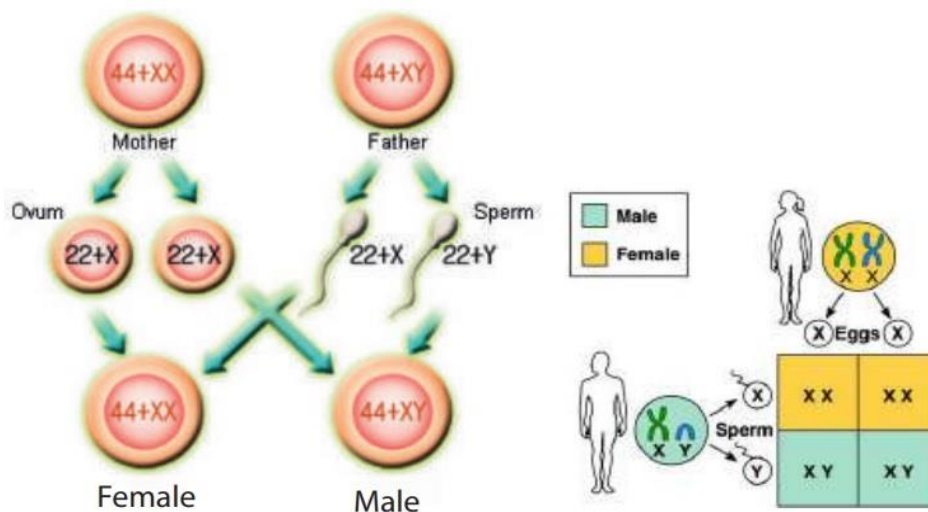
b) Factors affecting solubility

There are three main factors which govern the solubility of a solute. They are:

- (i) Nature of the solute and solvent
- (ii) Temperature
- (iii) Pressure

- (i) Nature of the solute and solvent - The nature of the solute and solvent plays an important role in solubility. Although water dissolves an enormous variety of substances, both ionic and covalent, it does not dissolve everything. The phrase that scientists often use when predicting solubility is "like dissolves like." This expression means that dissolving occurs when similarities exist between the solvent and the solute. For example: Common salt is a polar compound and dissolves readily in polar solvent like water. Non polar compounds are soluble in non-polar solvents For example, Fat dissolved in ether. But non-polar compounds do not dissolve in polar solvents; polar compounds do not dissolve in non-polar solvents.
- (ii) Effect of Temperature
- a) Solubility of Solids in Liquid: Generally, solubility of a solid solute in a liquid solvent increases with increase in temperature. For example, a greater amount of sugar will dissolve in warm water than in cold water. In endothermic process, solubility increases with increase in temperature. In exothermic process, solubility decreases with increase in temperature.
- b) Solubility of Gases in liquid : Solubility of gases in liquid decrease with increase in temperature. Generally, water contains dissolved oxygen. When water is heated, the solubility of oxygen in water decreases, so oxygen escapes in the form of bubbles. Aquatic animals live more in cold regions because, more amount of dissolved oxygen is present in the water of cold regions. This shows that the solubility of oxygen in water is greater at low temperatures.
- iii) Effect of Pressure Effect of pressure is observed only in the case of solubility of a gas in a liquid. When the pressure is increased, the solubility of a gas in liquid increases. The common examples for solubility of gases in liquids are carbonated beverages, i.e soft drinks, household cleaners containing aqueous solution of ammonia, formalin- aqueous solution of formaldehyde, etc.

- 35 a)
- 1) Human Recall that human beings have 23 pairs of chromosomes out of which 22 pairs are autosomes and one pair (23rd pair) is the sex chromosome.
 - 2) The female gametes or the eggs formed are similar to their chromosome type (22+XX).
 - 3) Human females are homogametic.
 - 4) The male gametes or sperms produced are of two types. They are produced in equal proportions.
 - 5) The sperm bearing (22+X) chromosomes and the sperm bearing (22+Y) chromosomes.
 - 6) The human males are called heterogametic.
 - 7) It is a chance of probability as to which category of sperm fuses with the egg.
 - 8) If the egg (X) is fused by the X bearing sperm an XX individual (female) is produced.
 - 9) If the egg (X) is fused by the Y-bearing sperm an XY individual (male) is produced.
 - 10) The sperm, produced by the father, determines the sex of the child. The mother is not responsible in determining the sex of the child.
 - 11) Fertilization of the egg (22 + X) with a sperm (22+X) will produce a female child (44+XX).
 - 12) While fertilization of the egg (22+X) with a sperm (22+Y) will give rise to a male child (44+XY).



Sex determination in human

b) 1) Process of sexual reproduction in flowering plants. It involves:

1. Pollination
2. Fertilization

1) Pollination The transfer of pollen grains from anther to stigma of a flower is called as pollination.

Types of Pollination

a) Self-pollination

b). Cross pollination Self-pollination (Autogamy)

a)Self-pollination is also known as autogamy The transfer of pollen grains from the anther to the stigma of same flower or another flower borne on the same plant is known as self-pollination e.g. Hibiscus.

Advantages of self pollination

1. Self-pollination is possible in bisexual flowers.
2. Flowers do not depend on agents for pollination.
3. There is no wastage of pollen grains.

Disadvantages of self-pollination

1. The seeds are less in numbers
- 2 The endosperm is minute. Therefore, the seeds produce weak plants.
3. New varieties of plants cannot be produced

Cross pollination:

Cross-pollination is the transfer of pollen from the anthers of a flower to the stigma of a flower on another plant of the same species e.g. apples, grapes, plum, etc.

Advantages of cross pollination

1. The seeds produced as a result of cross pollination, develop and germinate properly and grow into better plants, i.e. cross pollination leads to the production of new varieties.
2. More viable seeds are produced.

Disadvantages of cross-pollination

1. Pollination may fail due to distance barrier.
2. More wastage of pollen grains
3. It may introduce some unwanted characters
4. Flowers depend on the external agencies for pollination.