Grade 10 Science AP 2023

PART A

SECTION-I

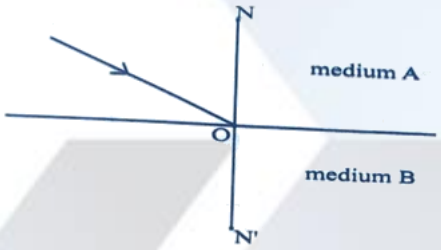
Q1. Ask a question about temperature.

Solution:

What is temperature and their SI unit?

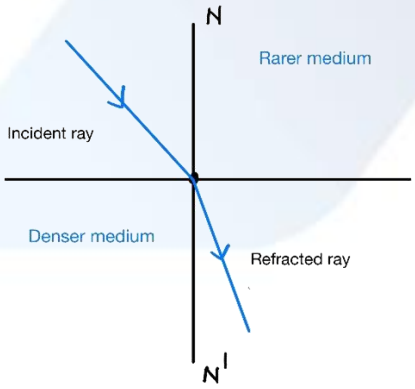
[Temperature is a quantity which determines the direction of flow of heat on keeping two bodies at different temperatures in contact. Its SI unit is kelvin (K).]

Q2. A light ray is entering from rarer medium A to denser medium B as shown in figure. Then complete the path of light in medium B and and draw the whole diagram in your answer sheet.



Solution:

When a light ray passes from a rarer medium A to a denser medium *B* the refracted light ray bends towards the normal to the boundary between the two media



Q3. Electronic configuration of an element is $1s^2 2s^2 2p^4$, then which period it belongs?

Solution:

The name of the given element is oxygen as the atomic number is 8.

Since the last electron enters 2^{nd} shell, it belongs to $\mathbf{2}^{nd}$ period.

Q4. Electronic configuration of an element ' X ' is 2,8 . Then write number of valency electrons.

Solution:

Element ' X ' has eight valence electrons because the number of valency electrons is the number of electrons in the outermost shell

Q5. Name the device which converts electrical energy into mechanical energy.

Solution:

A motor is the device which converts electrical energy into mechanical energy.

Q6. Write any one daily life application of the thermite process.

Solution:

Thermite process is used:

- To join railings of railway track
- To join cracked machine parts

SECTION - II

Q7. What is lens formula? Explain terms in it.

Solution:

The lens formula is given as:

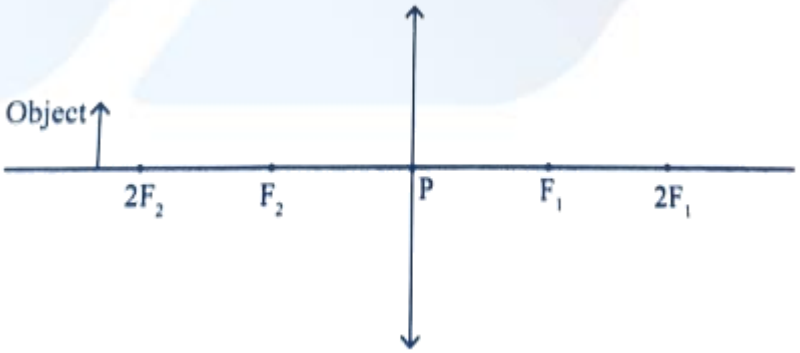
$$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$$

Where, u = object distance

v = image distance, and

f = focal length of the lens

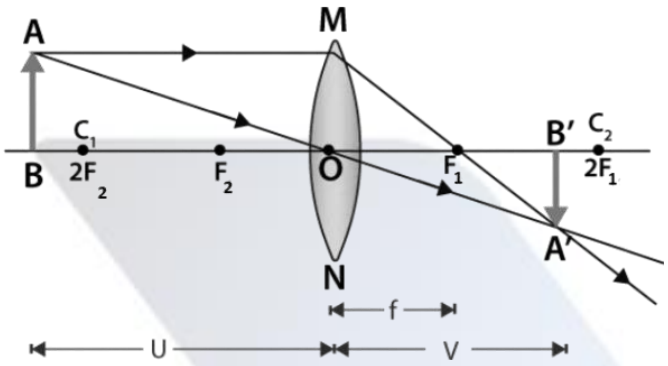
Q8.



Write the characteristics of the image formed by the object in the above diagram.

Solution:

If the lens is a convex lens, then the image will be formed as:



The image formed will be real, inverted and diminished. And the image will be formed in between $2F_1$ and F_1.

Q9. Predict which has more atomic size in between Na and Na^+, why?

Solution:

The total number of electrons present in Na^+ are 10 and in a Na atom is 11 . So, the force of attraction which would be present on the electron must be more in the case of Sodium ion as compared to the Sodium atom which will lead to the smaller size in case of Sodium ion.

Q10. Ask any two questions to understand about "magnetic field lines".

Solution:

(a) What are magnetic field lines?
[Magnetic field lines are imaginary lines, which depict the strength and direction of the magnetic field.]

(b) Where do the magnetic lines of a magnet start and end?
[Magnets have two poles, a north pole and a south pole. The magnetic field is represented by field lines that start at a magnet's north pole and end at the south pole.]

(c) How do magnetic lines flow inside a magnet?
[Inside the magnet, the direction of field lines is from its south pole to its north pole. Thus, the magnetic field lines are closed curves.]

SECTION – III

Q11. What is the reason behind the shining of diamonds and how do you appreciate it?

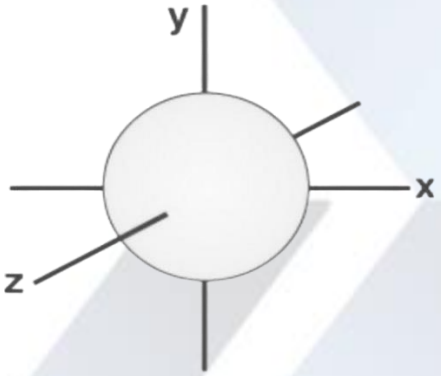
Solution:

- Diamonds have the highest refractive index which makes their critical angle of a diamond very low 24.4^0
- So if a light ray enters a diamond it is very likely to undergo total internal reflection due to which the light ray entering diamond goes through multiple internal reflection causing shining of diamond.
- So total internal reflection is the main cause of the brilliance of diamonds.
- The majority of people are attracted towards diamonds due to this property.

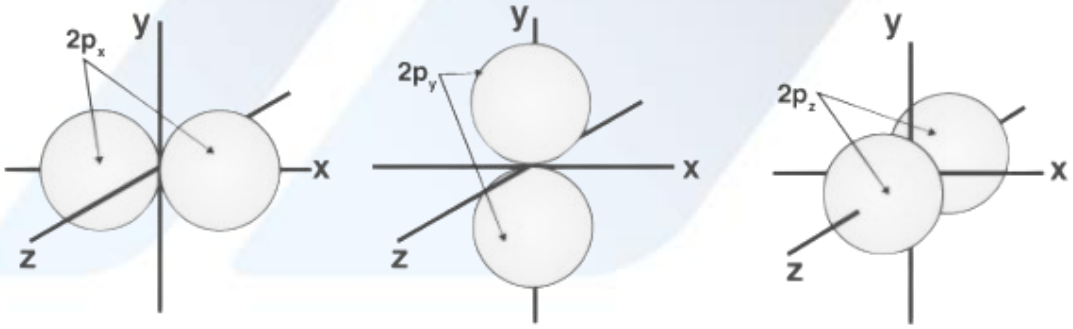
Q12. Draw the shape of S and P orbitals.

Solution:

The shape of the s-orbital is spherical as shown below.



The shape of the p-orbital is a dumbbell shaped as shown below.



Q13. Some ore and their formulae are given in the following table.

Ore	**Formula**
Bauxite	$Al_2O_3 \cdot 2H_2O$

Magnesite	$MgCO_3$
Epsom salt	$MgSO_4 \cdot 7H_2O$
Hematite	Fe_2O_3
Galena	Pbs
Gypsum	$CaSO_4 \cdot 2H_2O$

Answer the following questions using above table.

Solution:

a) Galena is an ore of lead (Pb) metal.
b) Hematite is ore of Iron.
c) The carbonate ore from the above table is Magnesite ($MgCO_3$).
d) The number of water molecules which are present in Epsom salt is 7

Q14. Write any four differences between evaporation and boiling.

Solution:

Evaporation	Boiling
Evaporation is a normal process that occurs when the liquid form changes into the gaseous form; while causing an increase in the pressure or temperature.	Boiling is an unnatural process where the liquid gets heated up and vaporized due to continuous heating of the liquid
Evaporation usually occurs on the heated liquid's surface.	Boiling usually occurs on the entire mass of the liquid that gets heated up
Bubbling effect is not visible in evaporation.	Bubbling effect is visible during the process of boiling
The process of evaporation is slow.	The process of boiling is much quicker.

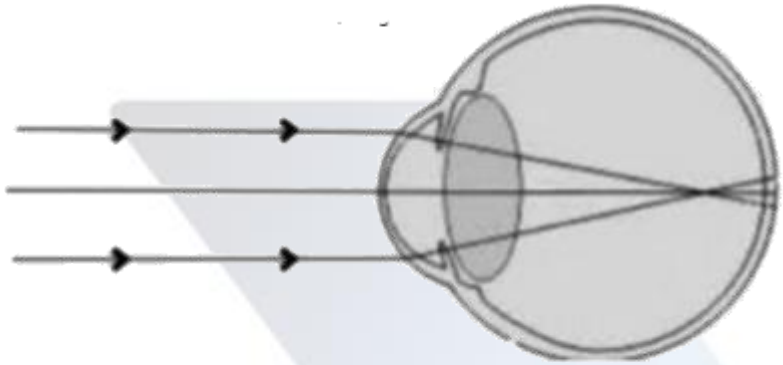
(OR)

Define the eye defect 'Myopia' and explain the process of correction.

Solution:

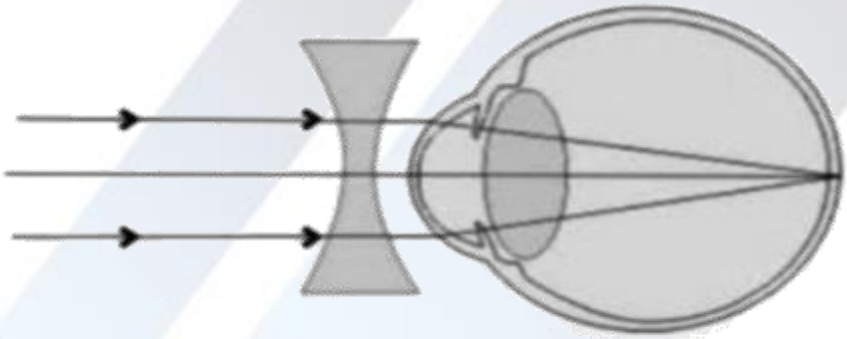
Myopia, or short-sightedness, is a vision problem where a person can't see objects that are far away, but can see nearby objects clearly. In a myopic eye, the image of

a distant object forms in front of the retina. This problem can be fixed with a concave lens.



Correction of Myopia:

- A concave lens helps fix nearsightedness (myopia) by being thinner in the middle and thicker at the edges.
- It spreads out light entering the eye so that it focuses slightly further back, directly on the retina instead of in front of it.



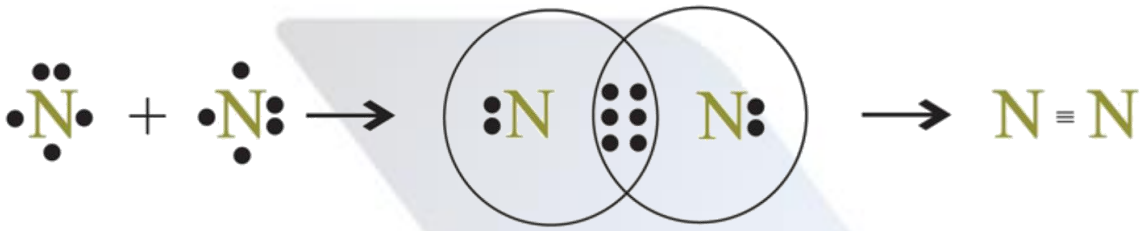
SECTION - IV

Q15. Explain the formation of N_2 molecule.

Solution:

- The electronic configuration of ' N ' atom is 2,5 and to have an octet in the valence shell it requires three more electrons.
- When two nitrogen atoms approach each other, each atom contributes 3 electrons for bonding.

- There are six electrons shared between two nitrogen atoms in the form of three bond pairs.
- Therefore, there is a triple bond between two nitrogen atoms in the N2 molecule.

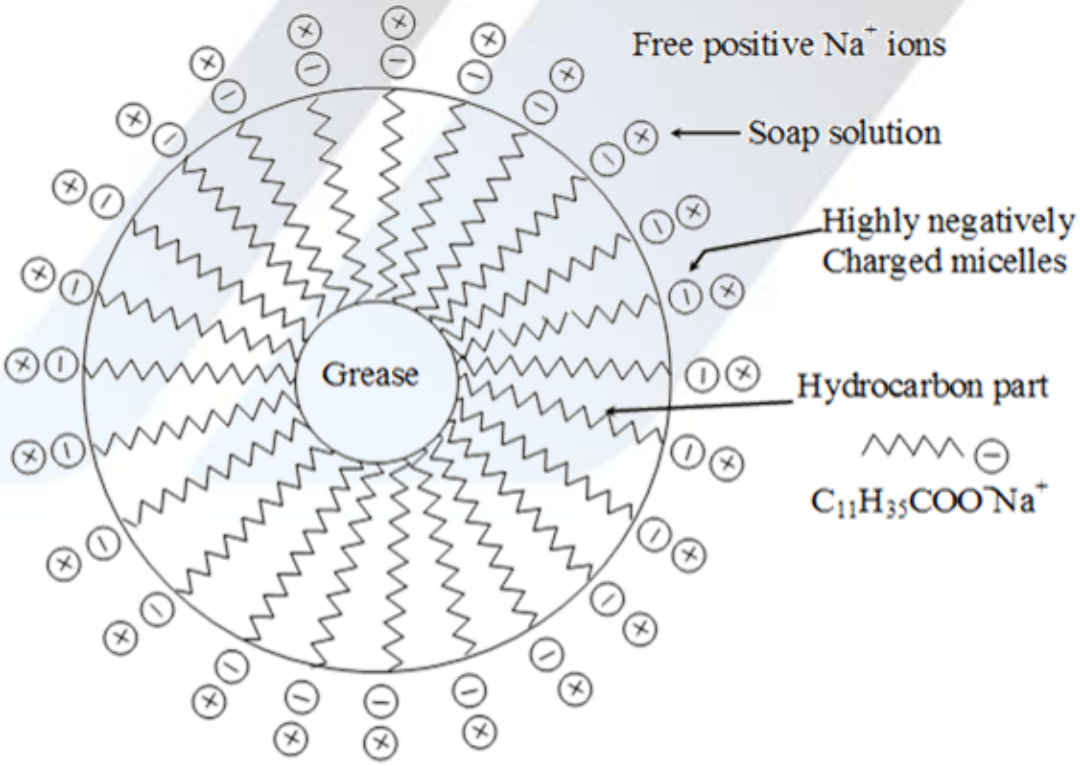


(OR)

Q16. Explain the cleansing action of soap.

Solution:

Mostly the dirt is held to any surface such as cloth by the oil or grease which is present there. Now since the oil and grease are not soluble in water, the dirt particles cannot be removed by simply washing the cloth with water. However, when soap is applied, the non-polar hydrocarbon part of the soap molecules dissolves in oil droplets while the polar - $COO^{-}Na^{+}$groups remain attached to water molecules. In this way, each oil droplet gets surrounded by negative charge.



These negatively charged oil droplets cannot coalesce and continue breaking into small droplets. These oil droplets (containing dirt particles) can be washed away with water along with dirt particles. So, the action of soap or detergents is to emulsify oil or grease, this loosens the solid particles of dirt and they are removed.

Q17. State Ohm's law. Suggest an experiment to verify it and explain the procedure.

Solution:

Ohm's law states that the voltage across a conductor is directly proportional to the current flowing through it, provided all physical conditions and temperatures remain constant.

$V \alpha I$

$V = IR$

$R = \frac{V}{I}$

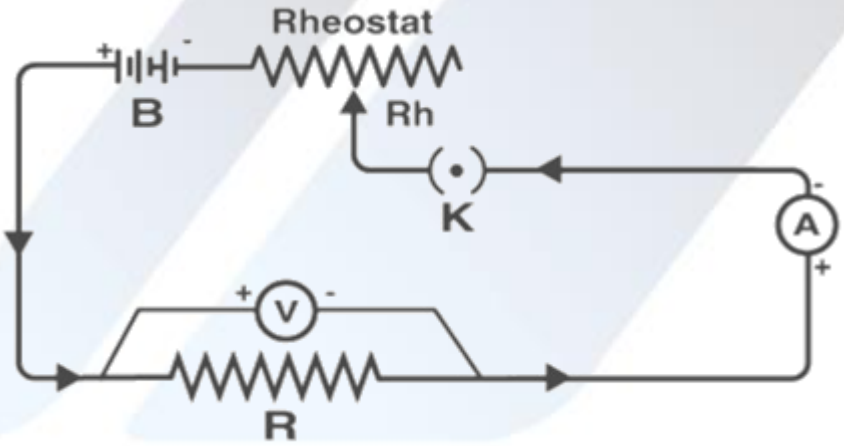
Aim: To verify ohm's law

Apparatus Required:

Resistor, ammeter, voltmeter, battery, plug key, rheostat

Circuit Diagram:

‘



Experimental procedure:

1) Initially, the switch key (K) is closed and the rheostat is adjusted to get the minimum reading in ammeter A and voltmeter V .

2) The current in the circuit is increased gradually by moving the sliding terminal of the rheostat. During the process, the current flowing in the circuit and the corresponding value of potential difference across the resistance wire *R* are recorded.

3) This way different sets of values of voltage and current are obtained.
4) For each set of values of V and I, the ratio of V/I is calculated.
5) When you calculate the ratio V/I for each case, you will come to notice that it is almost the same. So V/I = R, which is a constant.
6) Plot a graph of the current against the potential difference, it will be a straight line. This shows that the current is proportional to the potential difference

(OR)

What is water of crystallisation of salts? Suggest an activity to explain it.

Solution:

Water molecules that are part of a crystal's structure are called water of crystallization. Salts that have this water are called hydrated salts.
Following is the activity to explain the water of crystallization in copper sulphate crystals.
Aim: To explain the water of crystallization in copper sulphate (CuSO4.5H2O) crystals.
Materials required:
copper sulphate crystals, china dish, spatula, and Bunsen burner
Procedure:

- Put 2g of copper sulphate crystals on a china dish
- Heat it using a Bunsen burner.

Observations:

- Initially , the copper sulphate crystals are blue in colour.
- When copper sulphate crystals are heated strongly, they lose 5 molecules of water of crystallization to form anhydrous copper sulphate which is white in color.

Conclusion:
Crystalline substances have water in them, which they lose when heated. For example, anhydrous copper sulfate is a white powder that turns blue when it absorbs moisture.

Part B (Biological Science)
SECTION - I

Q18. Which vitamin is responsible for clotting of blood?

Solution:

Vitamin K is responsible for clotting of blood.

Q19.

Nostrils ⇄ Nasal Cavity ⇄ Pharynx ⇄ □ ⇄ Trachea ⇄ Bronchus.

Solution:

Nostrils → Nasal Cavity → Pharynx → Larynx → Trachea → Bronchus.

Q20. Observe the given table and solution the question.

Name of the Animal	Weight of the body	Weight of the heart	No. of beats/ min.
Blue whale	1,50,000Kg	750 Kg	7
Elephant	3000 Kg	12 – 21Kg	46
Man	60 – 70Kg	300 gm	72
Coaltit (Bird)	8 gm	0.15 gm	1200

What is the relation between weight of the heart and rate of heart beat?

Solution:

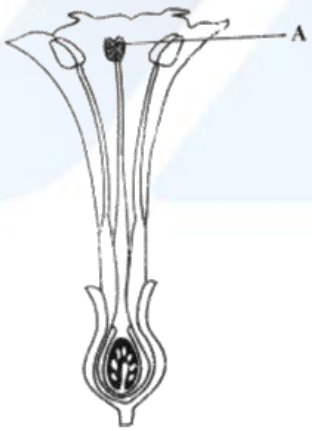
From the given information in the table, we can conclude that as the weight of the heart is more, the rate of heart beat is becoming less.

Q21. What will happen if Insulin production is stopped from pancreas?

Solution:

Pancreas secretes insulin hormone which helps in controlling the glucose level in the blood by converting it into glycogen. If pancreas doesn't produce enough (or) completely stops producing insulin, it will increase the amount of glucose in the blood. This condition is known as diabetes.

Q22. Name the Part *A* in the given diagram.



Solution:

Part A is female reproductive structure known as Stigma. It receives pollen grain and helps them reach ovaries through pollen tube.

Q23. Write one suggestion to reduce the effects of Global Warming.

Solution:

Global warming is the phenomenon of gradual increase in the average temperature of earth. Following are a few suggestions to reduce the effect of global warming

(1) Planting trees

(2) Creating more sustainable means of transportation, driving a fuel-efficient vehicle

(3) Judicious use of electricity, power your home with renewable energy

SECTION-II

Q24. If you have a chance to meet a nephrologist what questions will you ask to know more about kidney failure?

Solution:

(1) What caused my kidney failure?

(2) Do I have conditions like high blood pressure or diabetes that could make my kidney failure worse?

(3) If my kidney problem is temporary, will I recover, and how long will it take?

(4) If my kidney problem is long-term, how long can I manage without dialysis, and will I need it in the future?

(5) Which type of dialysis is best for me?

(6) Am I suitable for a kidney transplant?

(7) What diet changes should I follow during treatment or recovery? Do I need to change my lifestyle in other ways?

Q25. What is the main function of afferent neurons or sensory neurons?

Solution:

The primary role of afferent neurons, also known as sensory neurons, is to transmit sensory signals from the body's tissues and organs to the central nervous system, including the brain and spinal cord. They are responsible for detecting stimuli such as touch, temperature, pain, sound, and light, allowing the body to react accordingly.

Q26. Fill in the empty boxes (a) and (b).

Type of teeth	Number	Function
1. (a)	8	Biting
2. Canines	(b)	Tearing
3. Premolars	8	Chewing and grinding
4. Molars	12	Chewing and grinding

Solution:

Humans have four types of teeth, each serving a different function. The number of each type varies depending on age and whether the person has their permanent or milk teeth.

Humans have four types of teeth:

Incisors (8), Canines (4), Premolars (8), Molars (12)

Adults usually have 32 teeth, while children have 20.

Type of teeth	Number	Function
1. (a) Incisors	8	Biting
2. Canines	(b) 4	Tearing
3. Premolars	8	Chewing and grinding
4. Molars	12	Chewing and grinding

Q27. What will happen if the primary consumers decrease in an ecosystem?

Solution:

If primary consumers (like herbivores) decrease in an ecosystem, plants may grow too much because they aren't being eaten. This can also affect animals (secondary and tertiary consumers) that depend on primary consumers for food, making it harder for them to survive. This can upset the balance in the ecosystem.

SECTION-III

Q28. Draw any food chain with four levels. What are producers and decomposers in a food chain?

Solution:

A food chain is a series of organisms in an ecosystem, where each one is consumed by the next. It represents the flow of energy and nutrients, beginning with producers (such as plants) that create their own food, and ending with consumers (like animals)

Example:

Sun → Grass (Producer) → Grasshopper (Primary Consumer) → Frog (Secondary Consumer) → Snake (Tertiary Consumer)

Producers: Producers are any plant or other organisms that produce their own nutrients through photosynthesis. The producers in a food chain include all autotrophs such as phytoplankton, cyanobacteria, algae, and green plants. These occupy the first level in the food chain.

Decomposers: Decomposers are organisms that get energy from dead or waste organic material. This is the last stage in a food chain. Decomposers are an integral part of a food chain, as they convert organic waste materials into inorganic materials, which enriches the soil or land with nutrients.

Q29.

ALKALOID	PLANT	PARTS	USES
Quinine	Cinchona officinalis (Cinchona)	Bark	Antimalarial drug
Nicotine	Nicotiana tobacum (Tobacco)	Leaves	Insecticide
Morphine, Cocaine	Papaver somniferum (Opium)	Fruit	Sedative, Pain killer
Reserpine	Rauwolfia serpentina	Root, bark	Medicine for Snake bite
Caffeine	Coffea arabica (Coffee Plant)	Seed	Central nervous system Stimulant
Nimbin	Azadirachta indica (neem)	Seeds, Barks, Leaves	Antiseptic
Scopolamine	Datura stramonium	Fruit, flower	Sedative
Pyrethroids	Tridax	Flower	Insecticides

Observe the above table and solution the following questions.

1. Which alkaloid is used as medicine for snake bite?

2. What is the scientific name of Neem plant?
3. From which part of the Cinchona Plant Quinine is Obtained?
4. What is the use of Morphine?

Solution:

1. Reserpine
2. Azadirachta indica
3. Bark
4. Sedative, Pain killer

Q30. Write any two phytohormones and their functions.

Solution:

Phytohormones are the hormones which are produced by plants. A few examples of phytohormones are cytokinin, gibberellin, auxin, ethylene, and abscisic acid.

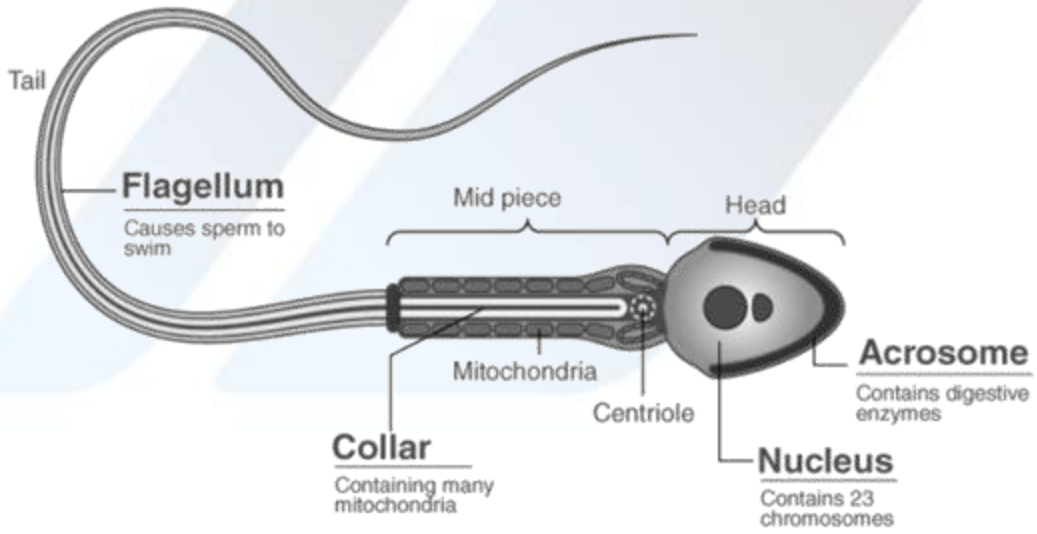
Auxin:

It is a growth-promoting hormone that promotes cell division, cell differentiation, and apical dominance.

Ethylene: It is a growth-inhibiting plant hormone that prevents lateral bud growth, promotes senescence, abscission, ripening of fruits and vegetables, etc.

Q31. Draw the diagram of the Human sperm cell and label the parts.

Solution:



Q32. Write few slogans on conservation of Trees.

Solution:

Conservation of trees helps protect the environment by providing clean air, reducing soil erosion, supporting wildlife, and maintaining the balance of nature.

(1) Plant a green tree and live younger.

(2) Save trees and save the air from pollution.

(3) Protect your Earth, Protect the Greenery.

(4) Help the birds build a nest, plant a tree.

(5) A tree today, a green tomorrow!

Q33. Write the differences between Arteries and Veins.

(OR)

Explain the process of sex determination in human beings.

Solution:

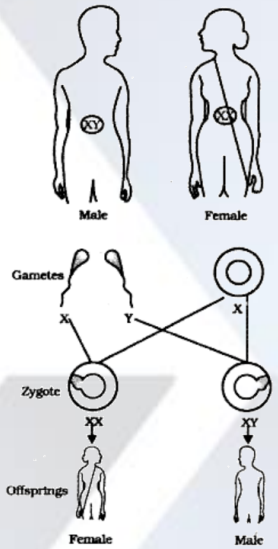
S.NO	Arteries	Veins
1	Arteries carry pure and oxygenated blood which is rich in nutrients.	Veins carry impure and deoxygenated blood
2	These have rigid, and thicker walls.	Veins have thin walls
3	These carry blood from the heart to the various body parts and tissues.	These carry blood from the various body parts and tissues to the heart.
4	Arteries are located deep within the body.	Veins are superficial and peripherally located closer to the skin.
5	These are red colored vessels.	These are red colored vessels.
6	Valves are absent in the arteries	Valves are present in the arteries
7	Blood flows through arteries under high pressure.	Blood flows through veins under low pressure.

(OR)

In human the nucleus of each cell contains 46 chromosomes (or) 23 pairs of chromosomes of body charactersand 1 pair is of sex chromosomes (responsible for determination of sex).

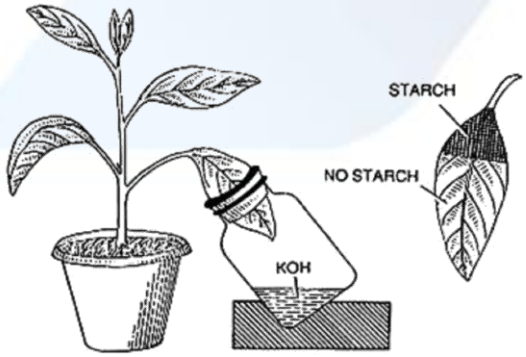
- Most human chromosomes have a maternal and a paternal copy.
- We have 23 such pairs. But one pair called the sex chromosomes.

- Women a perfect pair of sex chromosomes called X but men have a mismatched pair in which one is a normal sized X while the other is a short one called Y.
- So, women have XX type chromosomes while men have XY type chromosomes.
- All children will inherit an X chromosome from their mother regardless of whether they are boys or girls.
- Thus, A child who inherits an X chromosome from her father will be a girl and one who inherits a Y chromosome from him will be a boy.



Q34. How do you prove that heat is liberated during respiration?

(OR)



Observe the above diagram and answer the following questions.

1 What is the aim of this experiment ?
2 Which solution is taken in the bottle ?
3 After lodine test, the part of the leaf inside the bottle didn't turn into blue black colour Why?
4 Where do we keep the plant before experiment?

Solution:

Aim: To prove that heat is liberated during respiration.

Apparatus: Thermos flasks, thermometers, rubber corks, dry seeds, germinating seeds.

Procedure:

(1) Take some moong or bajra seeds.
(2) Soak the seeds in water one day before the experiment.
(3) Put the soaked seeds in a cloth pouch and tie it with a string.
(4) The next day, put the sprouted seeds in one thermos flask and dry seeds in another.
(5) Make a hole in a cork and insert thermometers so the bulbs touch the seeds in both flasks.
(6) Close the thermos flasks with the corks.
(7) Note the starting temperature in both flasks and check the temperature every two hours for 24 hours.

Observation: The thermometer in the germinating seeds shows a steady increase in temperature.

Result: This shows that germinated seeds breathe and release heat, which causes the temperature to rise.

If we do this experiment with dry seeds, the thermometer will show no change in temperature. The dry seeds don't respire, so the temperature doesn't increase.

(OR)

(1) The aim of this experiment is to prove that $C0_2$ is essential for photosynthesis.
(2) Potassium hydroxide [KOH] solution is taken in the bottle.
(3) After iodine test, the part of the leaf inside the bottle didn't turn into blue black color because it doesn't undergo photosynthesis. It happened because the KOH solution in the bottle absorb the $C0_2$ which is present inside the bottle.

(4) Before the experiment, we keep the plant in dark place for a week. It makes the plant consume the starch present in it.