CBSE Class 10 Science

Sample Paper 09 (2020-21)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.
ii. Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple-choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.
iii. Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should in the range of 30 to 50 words.
iv. Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should in the range of 50 to 80 words.
v. Section–D - question no. 34 to 36 are long answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120 words.
vi. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
vii. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Give one example of endothermic reaction.

OR

Identify the oxidising agent (oxidant) in the reaction:

$Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$

2. Write the formula and then balance the following equation.

Ferrous sulphate + Sodium hydroxide → Ferrous hydroxide + Sodium sulphate

3. Which one of the following is not in a liquid state at 10^0 C?
   a. H_2O
   b. Glacial acetic acid
   c. C_2H_5OH
   d. Acetone
4. What is the function of voltmeter in an electric circuit?
5. Black coffee is acidic, basic or neutral in nature?
6. Can a concave mirror give a virtual image ?

OR

What is monochromatic light?

7. Mention the amount of solar energy captured by the green plants out of the total energy that reaches on the earth from the Sun and mention the percentage of energy, which is transferred from one trophic level to next higher one.
8. Under what condition, the induced current produced in moving conductor in a magnetic field can be maximum?
9. What is the use of voltmeter and ammeter? How are they connected in circuit?

OR

Define the unit of electric current.

10. What happens when calcium is treated with water?
11. Name a muscular structure that separates the thoracic cavity and abdominal cavity.

OR

Why is urine yellow in colour?

12. What is the source of variation in monoparental (asexual) reproduction?

OR

Name the type of cell division in which chromosomes number is reduced to half.

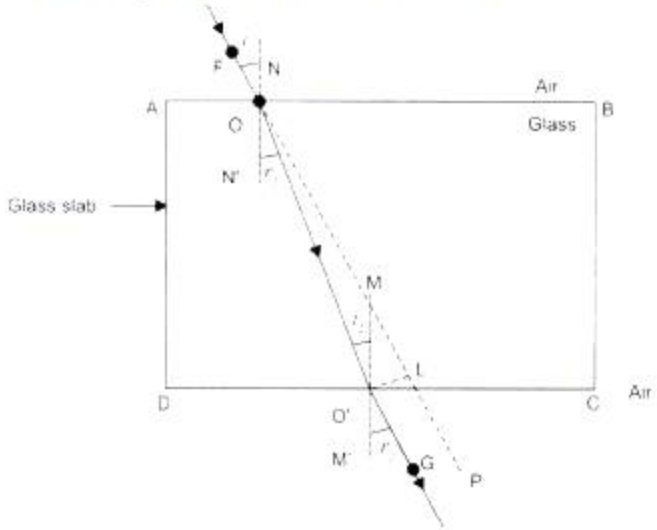
13. What will happen, if one kidney of a person is removed?

14. **Assertion (A):** Weak acids have low electrical conductivity.
    Reason (R): Strong acids and weak acid have an equal concentration of hydrogen ions in their solutions.
    a. Both A and R are true and R is the correct explanation of the assertion.
    b. Both A and R are true and R is the correct explanation of the assertion.
    c. A is false but R is true.
    d. A is true but R is false.
15. **Assertion:** When the length of a wire is doubled, then its resistance also gets doubled.
    Reason : The resistance of a wire is directly proportional to its length.
    a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
    b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
    c. Assertion is CORRECT but, reason is INCORRECT.
    d. Assertion is INCORRECT but, reason is CORRECT.

    OR

    Assertion (A): On freely suspending a current-carrying solenoid, it comes to rest in NS direction just like a bar magnet.
    Reason (R): One end of current-carrying straight solenoid behave as a north pole and the other end as a south pole.
    a. Both A and R are true and R is correct explanation of the assertion.
    b. Both A and R are true but R is not the correct explanation of of the assertion
    c. A is true but R is false.
    d. A is false but R is true.
16. **Assertion (A):** Yeast multiplies in sugar.
    Reason (R): Sugar is made of sucrose which provides energy for sustaining all life activities.
    a. Both A and R are true and R is correct explanation of the assertion.
    b. Both A and R are true but R is not the correct explanation of the assertion.
    c. A is false but R is true.
    d. A is true but R is false.
17. **Read the following and answer any four questions:**

In the refraction of light through a rectangular glass slab, the light ray changes its direction at the point O and O' and at O' the light ray has entered from glass to air bend away from the normal. The emergent ray is parallel to the incident ray. The incident ray, the refracted ray and the normal to interface of two transparent media at the point of incidence, all lie in the same line.



i. A ray of light passes from glass to air then an emergent ray is
   a. parallel to incidence ray
   b. perpendicular to incidence ray
   c. oblique to incidence ray
   d. inclined to incidence ray

ii. A ray of light is travelling from denser medium to rarer medium along the normal
   a. refracted toward the normal
   b. refracted away from the normal
   c. goes along the boundaries
   d. is not refracted

iii. The ray of light bends toward the normal while passing
   a. from denser to rarer medium
   b. from rarer to denser medium
   c. from denser to rarer medium
   d. from rarer to rarer medium

iv. In which material light ray travel faster
   a. air
   b. glass
   c. both (a) and (b)

d. none of the above

v. Glass has a _____ index of refraction from air

a. equal

b. greater

c. smaller

d. impossible to say

18. **Read the following and answer any four questions:**

We hear and read about female foeticide, which is really a wrong practice. In some families, be it rural or urban, females are tortured for giving birth to a girl child.

i. Female foeticide leads to which major problem in the country?

a. Female: male sex ratio is increasing

b. Female: male sex ratio is decreasing

c. Female: male sex ratio is unaffected

d. Male: female sex ratio is increasing

ii. Based on this pie chart, mention the most popular mode of contraception in Females across the world.

Couples Using Any Modern Method: 661 Million

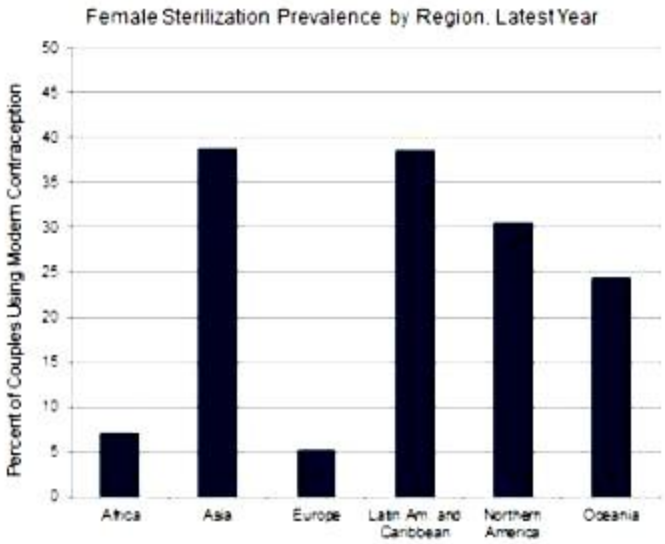
a. Female sterilisation (tubectomy)

b. IUD

c. Condoms

d. Oral pills

iii. Based on this column graph interpret the data-According to the latest survey, which continent is popular in female sterilization techniques?

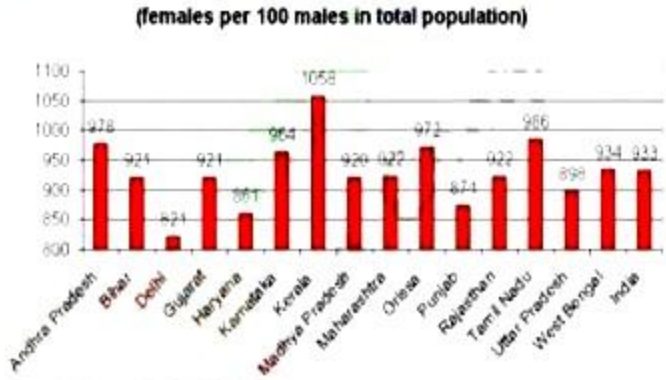


a. Asia and Europe
b. Asia and Latin America and the Caribbean islands
c. Africa and Europe
d. Latin America and North America

iv. Name two sexually transmitted diseases by bacteria.

a. AIDS and Syphilis
b. AIDS and genital warts
c. Gonorrhoea and syphilis
d. Gonorrhoea and warts

v. From the bar graph interpret which state is highest and lowest in female sex ratio?

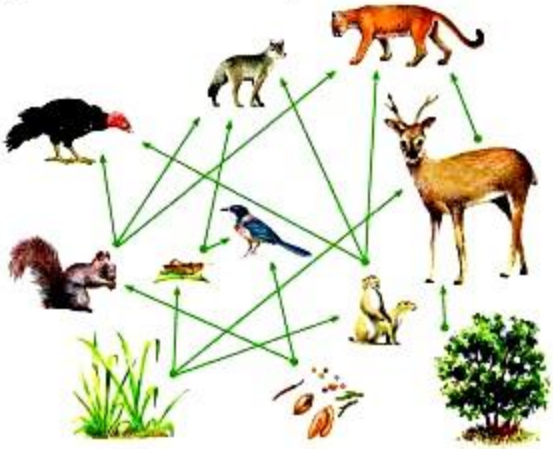


a. Andhra Pradesh and Tamilnadu
b. West Bengal and Uttar Pradesh
c. Kerela and Delhi
d. Kerela and Haryana

19. **Read the following and answer any four questions:**

The good 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.



i. How much energy is captured by green plants from sunlight?
   a. 1%
   b. 10%
   c. 4%
   d. 11%

ii. If a grasshopper is eaten by a frog, then the energy transfer will be formed:
   a. producer to decomposer
   b. producer to primary consumer
   c. primary consumer to secondary consumer
   d. secondary consumer to tertiary consumer

iii. Which of the following is not a producer?
   a. Grass
   b. Zooplankton
   c. Phytoplankton
   d. Paddy

iv. If the energy transferred to a tertiary consumer in a food chain is 10 J, how much energy was available to the primary consumer?
   a. 100 J
   b. 500 J
   c. 1000 J
   d. 5000 J

v. The ten per cent law is associated with:

a. transfer of energy from various trophic level to decomposer in a food chain
b. transfer of ATP energy into muscular energy
c. transfer of chemical energy from one organism to another
d. transfer of sun's energy to the organism called producers.

20. **Read the following and answer any four questions:**

22 samples of toothpaste and hand washes were randomly collected from markets in Delhi and sent for research. The analysis found one of the soap samples and 4 toothpaste samples contained the chemical beyond the permissible limit of 3000ppm. It is a disturbing trend that we find triclosan in such high concentration which has long term effects on the health of children

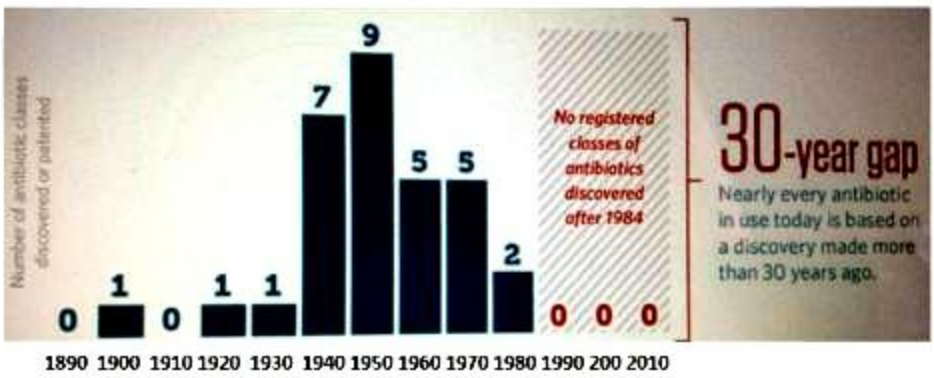
i. Why toothpaste is used for cleaning teeth?
   a. It is basic in nature
   b. It is acidic in nature
   c. It is neutral in nature
   d. None of these

ii. What is the chemical composition of tooth enamel?
   a. Calcium nitrate
   b. Calcium phosphate
   c. Magnesium carbonate
   d. Zinc phosphate

iii. How tooth enamel is damaged by chocolates and sweets?
   a. pH of mouth falls below 5.5
   b. pH of mouth falls below 2
   c. pH of the mouth rises to 8
   d. pH of the mouth is 7

iv. Identify the toxic chemical found in toothpaste.
   a. Glycerol
   b. Sodium Fluoride
   c. Sorbitol
   d. Triclosan

v. Which year shows the maximum number of antibiotics discovered to keep pace with new superbugs?



a. 1890

b. 1920

c. 1950

d. 2000

Section B

21. What is the function of lymphatic system?

OR

What are nutrients?

22. During sexual reproduction, the amount of DNA does not get doubled. Explain.
23. Draw the electron dot structures of the given compound and state the type of bonding : HCl
24. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid is added to test tube A, while acetic acid is added to test B. In which test tube will the fizzing occur more vigorously and why?
25. For what position of an object, a concave mirror forms a real image equal in size to the object?
26. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24Ω resistance, which may be used separately, in series, or in parallel. What are the currents in the three cases?
27. Why acquired characters are not inherited?

OR

How is the sex of the child determined in human beings?

28. A current of 1 ampere flows in a series circuit containing an electric lamp and a conductor of 5 Ω when connected to a 10 V battery. Calculate the resistance of the electric

lamp. Now if a resistance of 10 Ω is connected in parallel with this series combination, what change (if any) in current flowing through 5 Ω conductor and potential difference across the lamp will take place? Give reason.

29. How is food transported in plants?
30. A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.
    a. Write the chemical formulae of X and Y.
    b. Write a balanced chemical equation, when X is dissolved in water.
31. How does the reactivity of the metals vary in a group?
32. i. How does the tendency to gain electrons change as we go down a group? Give reason.
    ii. A part of the periodic table is given below. How does the valency vary, as we move vertically downward from Li to Fr? Give reason.

Li	Be
Na	
K	
Rb	
Cs	
Fr	Ra

33. Name the various processes used for refining of metals. Which method is used for refining of volatile metals?
34. How do carbohydrates, proteins and fats get digested in human beings?

OR

Describe the flow of blood through the heart of human beings.

35. What is dispersion of light? What is its cause?
36. Give magnetic field due to solenoid. On what factors the strength of the field depends?

OR

Draw a labelled diagram of an electric motor. Explain its principle and working. What is the function of split ring in an electric motor?

CBSE Class 10 Science

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Solution

Section A

1. Those reactions in which energy is absorbed are called endothermic reactions.
   $N_2 + O_2 \rightarrow 2NO - Heat\,(180.5kJ)$

   OR

   In the given reaction, Pb_3O_4 is the oxidant agent.

2.

Ferrous sulphate	+	Sodium hydroxide	→	Ferrous hydroxide	+	Sodium sulphate
$FeSO_4$	+	2NaOH	→	$Fe(OH)_2$	+	Na_2SO_4

3. (b) Glacial acetic acid

   Explanation: The freezing point of pure ethanoic acid is 16.6° C (61.9° F). The freezing point of pure water is 0° C. The freezing point of pure ethyl alcohol (C_2H_5OH) is -114.1° C.

   The freezing point of pure acetone is -95°C. When ethanoic acid (acetic acid) is cooled below 10° C, it freezes to form a colourless, ice-like solid. The solid looks like a glacier and hence pure ethanoic acid are called glacial ethanoic acid (or glacial acetic acid).
4. A voltmeter is an instrument used for measuring electrical potential difference between two points in an electric circuit.
5. Black coffee is acidic in nature.
6. Yes, concave mirror form virtual image of an object placed between pole and principal focus.

   OR

   The light of single wavelength is called monochromatic light, e.g., Sodium lamp is a source of monochromatic light.
7. In terrestrial ecosystem green plants capture about 1% of the energy of sunlight falling on earth into food by photosynthesis. On an average 10% energy is transferred from one

trophic level to next higher one.

8. When the direction of motion of the conductor is at a right angle to the magnetic field, the induced current is maximum.
9. Voltmeter is used to find potential difference whereas ammeter is used to find current. Voltmeter is connected in parallel and ammeter in series.

OR

The SI unit of electric current is ampere (A). When 1 coulomb of electric charge flows through any cross-section of a conductor in 1 second, the electric current flowing through it is said to be 1 ampere.

$$1\ \text{ampere(A)} = \frac{1\text{coulomb(C)}}{1\text{second(s)}}$$

10. Calcium reacts less violently with water and bubbles of hydrogen gas stick to its surface.
11. The diaphragm is the dome-like sheet of muscle that separates the thoracic and abdominal cavities.

OR

Urine is yellow in colour due to a pigment called urochrome.

12. The chromosomal aberrations and gene mutations are the only source of genetic variation in monoparental reproduction.

OR

Reductional division (meiosis)

13. Person can still survive because of other kidney. Second kidney will increase it's filtering capacity to compensate for the loss of other kidney.
14. (c) A is false but R is true.

    Explanation: Weak acids have low electrical conductivity because the number of ions furnished by weak acids is less as compared to strong acids in their aqueous solution.
15. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

OR

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

16. (a) Both A and R are true and R is correct explanation of the assertion.
17. i. (a) parallel to incidence ray
    ii. (b) refracted away from the normal
    iii. (b) from rarer to denser medium
    iv. (a) air
    v. (b) greater
18. i. (b) Female: male sex ratio is decreasing
    ii. (a) Female sterilisation (tubectomy)
    iii. (b) Asia and Latin America and Caribbean islands
    iv. (c) Gonorrhea and syphilis
    v. (c) Kerela and Delhi
19. i. (a) 1%
    ii. (c) primary consumer to secondary consumer
    iii. (b) zooplankton
    iv. (d) 5000 J
    v. (c) transfer of chemical energy from one organism to another
20. i. (a) It is basic in nature
    ii. (b) Calcium phosphate
    iii. (a) pH of mouth falls below 5.5
    iv. (d) Triclosan
    v. (c) 1950

Section B

21. The lymphatic system is essential for our survival. This system has three main functions:
    1. to collect and recycle the excess interstitial fluid and its dissolved substances,
    2. to absorb fats and other substances from the digestive tract (this topic will be discussed in the Digestive System Unit), and
    3. to initiate and coordinate an immune response to remove cellular debris, bacteria, toxins, fungi, parasites, and viruses that accumulate in our bodies.

OR

The substances which provide materials for growth, energy and maintenance are called nutrients. Carbohydrates, proteins and fats are the main nutrients and are called macronutrients. Minerals and vitamins are required in small amounts and hence are

called micronutrients.

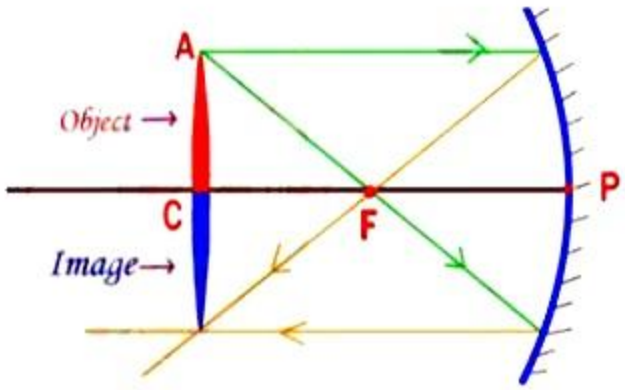
22. During sexual reproduction, the reproducing cells or germ cells have half the number (amount) of chromosomes and DNA as compared to somatic or body cells or non-reproducing cells. As the offspring receives one DNA copy from each parent, this complex mechanism helps to maintain the amount of DNA constant in an individual. If the DNA had to get doubled during sexual reproduction, then each generation would have double the amount of DNA content as compared to the previous generation. That is why, the amount of DNA does not get doubled during sexual reproduction.
23. H : Cl

    The hydrogen and chlorine atoms are linked by covalent bond formed [HCl] by the sharing of two electrons between the two atoms.
24. HCl is stronger acid than CH_3COOH. Therefore, H^+ ions concentration in test tube A will be more than that in test tube B.

    Most of the acids react with metals to form salts and evolve hydrogen gas. The reaction between magnesium ribbon and the acid will take place faster in test tube A than in test tube B due to the higher concentration of H^+ ions. Magnesium will displace hydrogen from hydrochloric acid and hydrogen will be evolved as a gas. The fizzing (evolution of hydrogen gas) will occur more vigorously in **test tube A** (containing hydrochloric acid).

    $Mg\ (s) + HCl\ (aq) \rightarrow MgCl_2\ (aq) + H_2\ (g)$
25. When an object is kept at the center of curvature of the concave mirror than the image formed is real, inverted and equal to the size of the object.

    The figure below shows the ray diagram follows:



26. It is given that potential difference (V) = 220 V.

    Resistance of coil A (R_A) = Resistance of coil B (R_B) = 24 Ω

    i. When either coil A or B is used separately, the current (I) $= \frac{V}{R} = \frac{220V}{24\Omega}$

= 9.2 A.

ii. When two coils are used in series, total resistance, $R_S = R_A + R_B$

= R_A+ R_B = 24 +24 = 48Ω

Current flowing (I) = $\frac{V}{R_S} = \frac{220V}{48\Omega} = 4.6A$

iii. When the two coils are joined in parallel,total resistance (R_p) = $\frac{1}{24} + \frac{1}{24} = \frac{2}{24}$

R_p = 12Ω

Current (I) = V/R_p = $\frac{220V}{12\Omega} = 18.3A$

27. Acquired traits are those characters which are acquired in the organisms during lifetimee time. They are not inherited to next generations. These traits are because of non-reproductive tissues and they cause no change in the DNA of the organisms.

OR

In human beings, the females have two X chromosomes and the males have one X and one Y chromosome. Therefore, the females are XX and the males are XY. The gametes, as we know, receive half of the chromosomes. The male gametes have 22 autosomes and either X or Y sex chromosome. Type of male gametes: 22+X OR 22+ Y. However, since the females have XX sex chromosomes, their gametes can only have X sex chromosome.
Sex determination in humans : Thus, the mother provides only X chromosomes. The sex of the baby is determined by the type of male gamete (X or Y) that fuses with the X chromosome of the female.

28. Total resistance of circuit(R) can be calculated as follows:

$R = \frac{V}{I} = \frac{10V}{1A} = 10\Omega$

Since lamp and conductor are in series so resistance of lamp

$= 10\Omega - 5\Omega = 5\Omega$

The new resistance in parallel to earlier combination has same value, i.e. 10Ω as the resistance of series combination. This means that the amount of current would be equally divided into two branches. Hence, 0.5A current will flow through 5Ω conductor.
Now, resistance remains the same but current has become half. Using Ohm law, V across the lamp can be calculated as follows:

$V = IR = 0.5A \times 5\Omega = 2.5V$

Thus total R =10 ohm, I =0.5 ampere, and potential difference across the conductors is 2.5 volt.

29. Food is transported in plants through phloem which consists of sieve tubes and companion cells. The food prepared in leaves is in the soluble form i.e, glucose. Active transport of food passes it to all other parts of plants.

30. 1. (a) X is MgO and Y is Mg_3N_2

    (b) $MgO + H_2O \rightarrow Mg(OH)_2$

31. In a group, containing metals, the reactivity increases down the group. For example, in the metals of group 1 (Alkali metals), Lithium reacts with water very slowly. Sodium is more reactive and potassium is still more reactive than sodium.

    When we move down every group, the size of the atom increases. Therefore, the release of the electrons from the valence shell of the atom becomes easier. Since the reactivity of the of the metals increases down a group.

32. i. Tendeny to gain electrons decreases or moving down a group because with increase in size, the electrostatic force of attarction between the nucleus and valence electron decreases and hence, valence shell electron are losely bounded. Thus. tendency to gain electron decreases.

    ii. Valency remains constant as we move downwards. Elements of same group have same number of valence electrons but different number of shells. Thus, there is no change in the valency down the group, but the number of shells increaes moving down the group.

33. The various processes used for refining of metals are :

    1. Liquation
    2. Distillation process
    3. Oxidation process.
    4. Electrorefining
    5. Zone refining

    Distillation process is used for purification of volatile metals.

34. **Carbohydrate Digestion:** Digestion of carbohydrates starts with a buccal cavity where salivary enzymes break down the starch into simple sugar molecules. Other sugar molecules are breakdown to glucose in a small intestine.

    Protein digestion: Proteins are partially digested by pepsin secreted by gastric glands present in the stomach. Then Pancreatic juice secrets trypsin and chymotrypsin enzymes in the small intestine where complete digestion of proteins takes place.

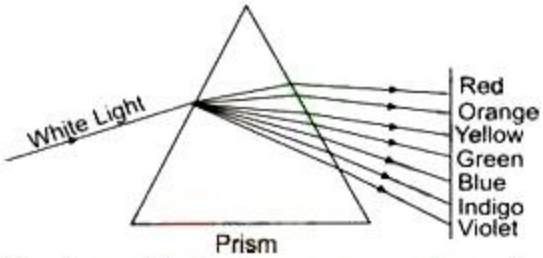
    Fat Digestion: Fats are digested in the small intestine. Bile juice present in the liver

emulsifies the fat which breaks fats into small globules. These small fat globules are converted into glycerol and fatty acids by the Lipase enzyme.

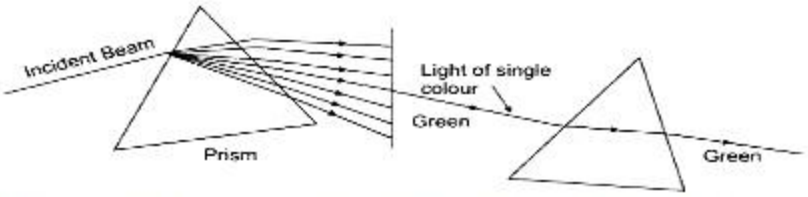
OR

The heart is the major organ of our body which continuously pumps oxygen and nutrient-rich blood throughout our body to sustain life. As the heart beats, it pumps blood through a system of blood vessels, called the circulatory system.
The blood enters the heart through two large veins, the inferior and superior vena cava, emptying oxygen-poor blood from the body into the right atrium. As the atrium contracts, blood flows from your right atrium into your right ventricle through the open tricuspid valve. When the ventricle is full, the tricuspid valve shuts. This prevents blood from flowing backward into the right atrium while the ventricle contracts. As the ventricle contracts, blood leaves the heart through the pulmonic valve, into the pulmonary artery and to the lungs, where it is oxygenated. The oxygenated blood then returns to the heart through the pulmonary veins. And finally, the oxygenated blood from the left ventricle is pumped through the aorta to the whole body.

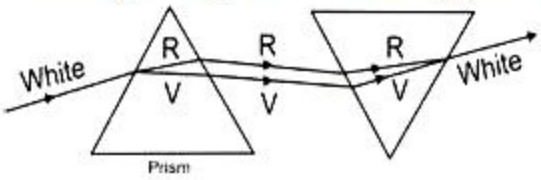
35. Dispersion of light: If a beam of white light falls upon one of the faces of the prism, it is seen in the other face of the prism that light has split up into seven colours. These colours are red, orange, yellow, green, blue, indigo and violet. The splitting of white light into its constituent colours is called dispersion and the coloured band obtained upon the screen is called a spectrum.



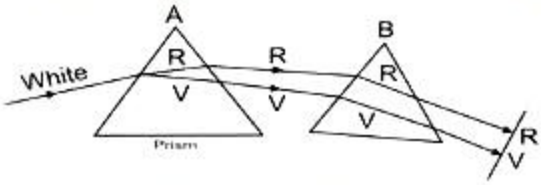
To show that colours are not produced by the prism but are present in white light itself and the prism only separates these, Newton isolated (separated) a particular colour say green. He placed another prism in the path of green beam. No further splitting of colour took place. The light was only deviated more. It clearly showed the prism just separates, a large number of colours coming together as white.



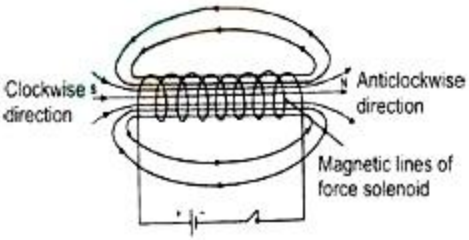
If a second prism exactly of same angle with its refracting edge opposite to the first is placed as shown, it is found that it results in white light again. The second prism deviates the rays in opposite direction. Thus dispersion produced by one prism is cancelled by the second prism placed in the opposite direction.



If the second prism is placed in the same way as the first, the coloured rays are again obtained on the screen but these are more spread.



36. A solenoid is a long circular coil containing a large number of close turns of insulated copper wire. When a electric current is passed through the solenoid, it produces magnetic field around it as shown in fig. Magnetic field produced by a current carrying solenoid is similar to the magnetic field produced by a bar magnet. As is clear from the figure, the lines enter from the left side and leave out from the right side. If we look from left side, the current appears to be passing in the coil in clockwise direction and hence it acts as a south pole according to clock rule. If the coil is viewed from right side, the current appears to be in anticlockwise direction. Hence, left-hand side face behaves as if this were a north pole. If the coil is left free, it will point South and North.
Since the current in the turns of the solenoid flows in the same direction, the magnetic field produced by each turn of the solenoid adds up, giving a very strong resultant field inside the solenoid. Hence, a solenoid may be used in making electromagnets.



Strength of the magnetic field produced depends upon the following three factors :
Number of turns: Large the number of turns, stronger will be the magnetic field

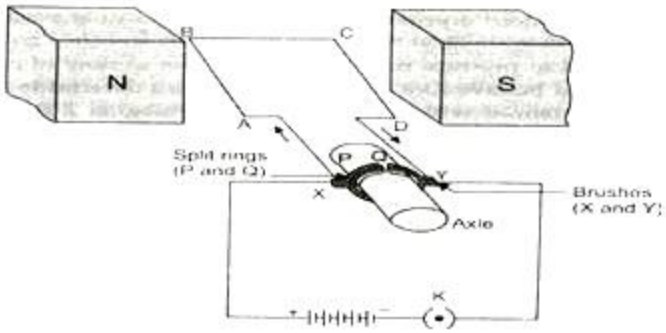
produced.

Strength of the current in the solenoid: Larger the current, stronger will be the magnetic field produced.

Nature of core of solenoid: The strength of the field depends upon the core on which the coil is wound. For air core, field is very mild whereas for iron-core, the field is very strong.

OR

Electric motor labelled diagram of an electric motor is as follows:



Principle: A current-carrying conductor, when placed in a magnetic field, experiences a force. If the direction of magnetic field and that of current are mutually perpendicular, then force acting on the conductor will be perpendicular to both and will be the given by Fleming's left-hand rule. Due to this force the conductor begins to move, if it is free to rotate.

Working: Let the current in the coil ABCD of motor enters from the source battery through the conducting brush X, flow along ABCD and finally flows back to the battery through brush Y. On applying Fleming's left-hand rule we find that force acting on arm AB due to magnetic field pushes it downwards. But the force acting on arm CD pushes it upwards. Thus, the coil and the axle rotate anticlockwise. Due to action of split rings P and Q change their contacts with brushes. Now, P makes contact with Y and Q with X. As a result, Current begins to flow in coil along DCBA. The arms are pushed in opposite direction and coil continues to rotate in same direction.