CBSE Class 10 Science
Sample Paper 03 (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 a combination reaction which is also exothermic.

OR

Name the type of reaction : Iron reacts with chlorine to form ferric chloride.

2. What is the role of a catalyst in a chemical reaction?

3. The number of C - H bonds in ethane C_2H_6 molecule is:

a. 8

b. 10

c. 4

d. 6

4. Can a plane mirror be called a spherical mirror?

5. Which phenomenon is responsible for increasing the apparent length of the day by 4 min?

6. What happens at cathode when an electric current is passed through an aqueous solution of an acid ?

OR

What is pH of tomato juice ?

7. A current of 0.5 A is drawn by a filament of an electric bulb for 10 minutes. Find the amount of electric charge that flows through the circuit.

8. What does the divergence of magnetic field lines near the ends of a current carrying straight solenoid indicate?

9. A battery of 9V is connected in series with resistors of 0.2Ω, 0.3Ω, 0.4Ω, 0.5Ω and 12Ω respectively. How much current will flow through a 12Ω resistor?

OR

What is measured by a voltmeter ?

10. What is the food of Amoeba?

11. What are the adaptation of leaf for photosynthesis?

OR

Name the system responsible for transportation of materials in human body.

12. To keep the environment clean, garbage disposal programme is an essential prerequisite. What methods constitute the garbage disposal programme?

OR

Would you eat animals or plants to get more calories of heat?

13. What are the end products of photosynthesis?

14. **Assertion:** $Fe_2 O_3 + 2 Al \rightarrow Al_2 O_3 + 2 Fe$

The above chemical equation is an example of a displacement reaction.

Reason: Aluminium is more reactive than iron, displaces Fe from its oxide.

   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.

15. **Assertion (A):** Man is a herbivore.

   Reason (R): Omnivores eat both plant food and meat of animals.

   a. A is false but R is true.

   b. Both A and R are true and R is correct explanation of the assertion.

   c. Both A and R are true but R is not the correct explanation of of the assertion

   d. A is true but R is false.

<div align="center">OR</div>

   Assertion (A): Carbohydrate digestion mainly takes place in the small intestine.

   Reason (R): Pancreatic juice contains the enzyme lactase.

   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 true but R is false.

   d. A is false but R is true.

16. **Assertion (A):** A geneticist crossed two pea plants and got 50% tall and 50% dwarf in the progeny.

   Reason (R): One plant was heterozygous tall and the other was dwarf.

   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:**

Ayush experienced muscular cramps during the training session for his upcoming cricket match. His coach advised him on a schedule of aerobic exercises to overcome this problem. Ayush followed his coach's advice and did not experience any muscular cramps

during the game.

i. Lack of oxygen in muscles often leads to cramps due to

   a. conversion of pyruvate to ethanol

   b. non-conversion of glucose to pyruvate

   c. conversion of pyruvate to glucose

   d. conversion of pyruvate to lactic acid

ii. Which substances are produced by anaerobic respiration in yeast?

	Lactic acid	Carbon dioxide
a	Yes	Yes
b	Yes	No
c	No	Yes
d	No	No

iii. The two graphs show the oxygen uptake and the lactic acid concentration in the blood of a man before, during and after a short period of physical exercise:
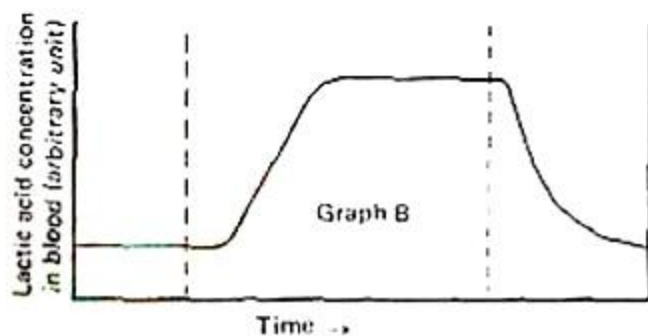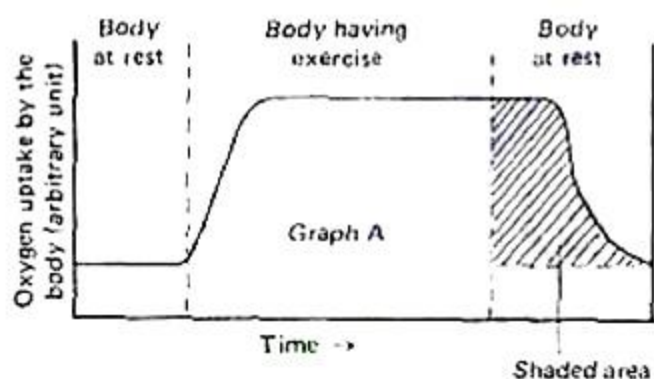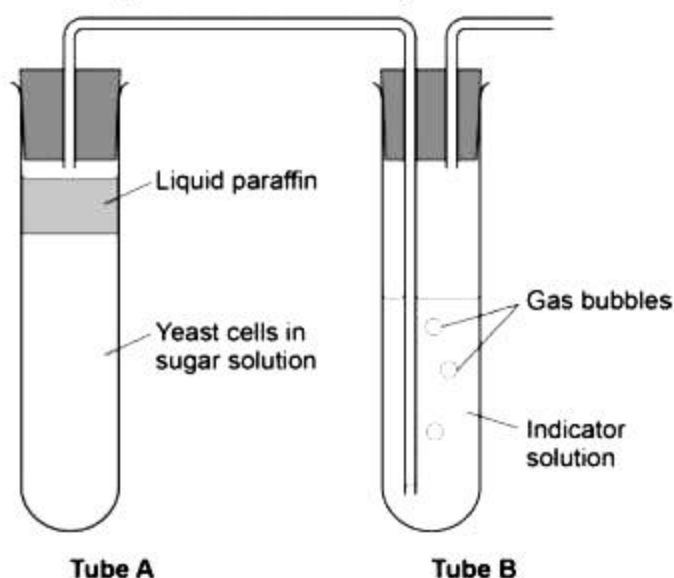

Why there is an increase in lactic acid concentration in the blood at the beginning of exercise?

   a. Lack of oxygen

   b. Excess of oxygen

c. Lack of carbon dioxide

d. Excess of carbon dioxide

iv. The diagram shows an experiment to investigate anaerobic respiration in yeast cell:

Tube A   Tube B

What is the purpose of liquid paraffin in tube A?

a. To prevent evaporation

b. To stop air from getting in

c. To stop the temperature from going up

d. To stop water from getting in

v. The indicator colour in tube B shows changes in the concentration of carbon dioxide If tube B contains lime water. What will be the colour after sometimes?

a. Milky

b. Black

c. Yellow

d. Blue

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

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

Test tube holder
Boiling tube
Water droplets
Copper sulphate cystals
Burner
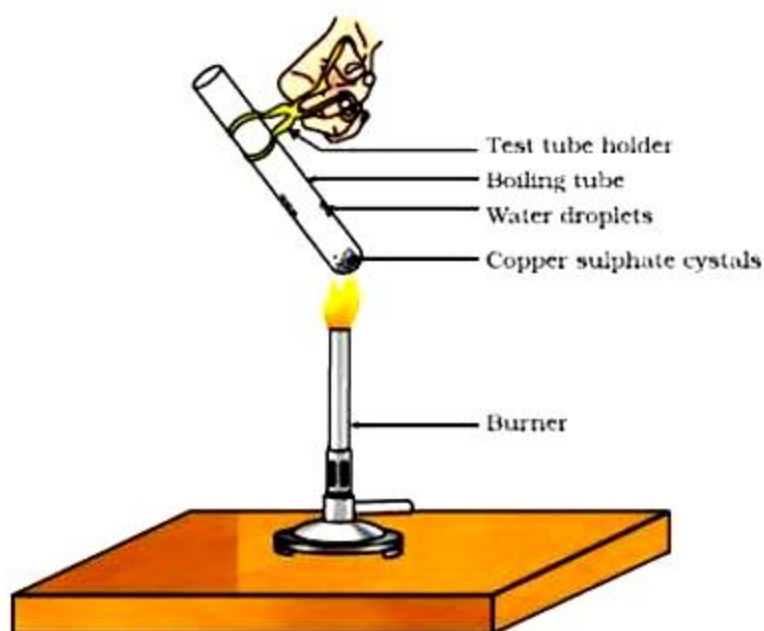
i. If the crystal is moistened with water _____ colour of crystal reappear
   a. blue
   b. green
   c. black
   d. pink

ii. What is the commercial name of calcium sulphate hemihydrate?
   a. Washing soda
   b. Bleaching powder
   c. Plaster of Paris
   d. Baking soda

iii. _____ water molecules are present in one formula unit of copper sulphate.
   a. Five
   b. Two
   c. Six
   d. Seven

iv. The calcium sulphate hemihydrate is prepared by heating one of the following to a temperature of 100C. This is
   a. $CaCO_3 \cdot \frac{1}{2} H_2O$
   b. $CaCl_2 \cdot \frac{1}{2} H_2O$
   c. $CaSO_3 \cdot \frac{1}{2} H_2O$

d. $CaSO_4 \cdot \frac{1}{2} H_2O$
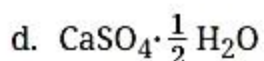
v. The salt which possesses water of crystalline solution is _____.

    a. baking soda

    b. gypsum

    c. washing soda

    d. bleaching powder

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

Resistance is the property of a conductor to resist the flow of charges through it. The current which flows through a resistor is inversely proportional to its resistance, If the resistance is double the current get halves. A component of identical size that offers a higher resistance is a poor conductor. An insulator of the same size offers even higher resistance. The resistance of the material depends on various factors. The resistivity of an alloy is generally higher than that of its constituent metal.

i. The resistance of a wire of length 300m and cross-section area 1.0 mm^2 made of material of resistivity $1.0 \times 10^{-7} \, \Omega$ m is:

    1. $2 \, \Omega$

    2. $3 \, \Omega$

    3. $20 \, \Omega$

    4. $30 \, \Omega$

ii. The resistivity of metal depends on:

    a. length

    b. nature of material

    c. area of cross-section

    d. all of these

iii. What happens to the resistance as the conductor is made thicker?

    a. Resistance decreases

    b. Resistance increases

    c. Resistance remains the same

    d. None of these

iv. Metals and alloys' resistivity is in the range _____.

    a. $10^{-10} \, \Omega$m to $10^{-5} \, \Omega$m

    b. $10^{-8} \, \Omega$m to $10^{-6} \, \Omega$m

c. $10^{-10}\,\Omega m$ to $10^{-6}\,\Omega m$

d. $10^{-9}\,\Omega m$ to $10^{-5}\,\Omega m$

v. Why alloy is commonly used in electrical heating devices like toaster etc?

    a. Alloy oxidise easily

    b. Alloy does not oxidise readily at high temperature

    c. Alloys is a good material

    d. Alloys are easily available

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

Sodium and chlorine are opposite charge ions that attach each other to form an ionic compound. In which sodium atom has 1 electron in its outermost M shell it loses 1 electron now L shell and obtained stable octet. While chlorine gains 1 electron to attain a stable configuration. They both combined to form NaCl. Ionic compounds have a high melting and boiling point. They are soluble in water.

i. Ionic compounds are held together by:

    a. van der Waal

    b. hydrogen bond

    c. dipole- dipole

    d. strong electrostatic force

ii. An ionic compound is formed by:

    a. sharing of electron

    b. transfer of electron

    c. both (a) and (b)

    d. none of these

iii. Ionic compound conducts electricity in a molten state because

    a. ions move freely

    b. the electrostatic force of attraction between ions is overcome due to heat

    c. ion is not able to move

    d. both (a) and (b)

iv. The atomic number of an element Y is 17. The number of electrons in its ion Y⁻ will be

    a. 17

    b. 18

    c. 19

    d. 20

v. Which one of the following properties is generally not exhibited by ionic compounds?

    a. Solubility in Water

    b. Electrical conductivity in solid-state

    c. High melting and boiling point

    d. Electrical activity in a molten state

Section B

21. What are the common features of the respiratory organs in aquatic and terrestrial animals?

<div align="center">OR</div>

Why the tracheal wall is supported by 'C' shaped cartilaginous rings?

22. Why does high temperature inhibit photosynthetic action?

23. An organic compound A is a constituent of many medicines and used as an antifreeze and has the molecular formula C_2H_6O. Upon reaction with alk. $KMnO_4$, compound A is oxidised to another compound B with formula $C_2H_4O_2$. Identify the compounds A and B. Write the chemical equation for the reaction which leads to the formation of B.

24. A group of students, while on excursion trip is campaigning on the hills. One morning, they find themselves engulfed in a thick blanket of snow. One of the senior member of the group suggests to sprinkle common salt on the ice slit covering the pavement. Now answer the following questions:

    i. What is the purpose of sprinkling common salt on ice slit?

    ii. Can we use any other substance in place of common salt?

    iii. What values are associated with the students?

25. Find the velocity of light in diamond. Given the velocity of light in glass is 2×10^8 ms^{-1}. Given refractive index of glass with respect to air is 1.5 and that of diamond with respect to air is 2.5.

26. What is the resistance between A and B in the network shown in the figure?
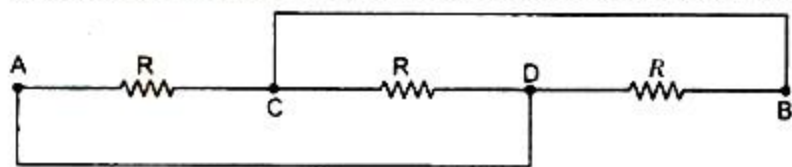

27. Mendel, in one of his experiments with pea plants, crossed a variety of pea plant having round seeds with one having wrinkled seeds. State Mendel's observations giving reasons

of F_1 and F_2 progeny of this cross. Also, list any two contrasting characters, other than round seeds of pea plants that Mendel used in his experiments.

OR

Anita had a huge scar on her cheek after she met with an accident during her school days. She is worried if her baby would inherit the scar she had acquired. Regarding this, she enquired it with her doctor, who upon hearing this said that she need not worry about it as her scar is an acquired trait. Read the given passage and answer the following questions:

  i. What are acquired traits?

  ii. How is it different from inherited traits?

  iii. Mention the values of the doctor that is shown in the passage.

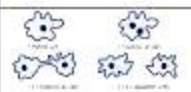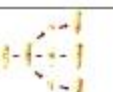28. A food web is given below, observe the figure and answer the questions given below.
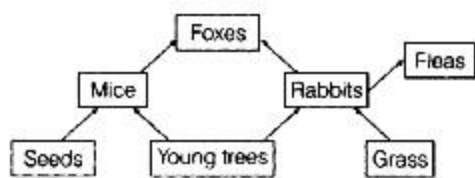
  i. Identify the primary consumer in the food web.

  ii. If all the foxes are killed due to a disease, what will your observations about food web be?

29. What is the function of digestive enzymes?

30. Explain the process of getting energy from carbohydrates.

31. Neon and argon are unreactive gases.

  i. What do their atoms have in common?

  ii. Why are they non-reacting gases?

32. The three elements A, B and C with similar properties have atomic masses X, Y and Z respectively. The mass of Y is approximately equal to the average mass of X and Z. What is such an arrangement of elements called as? Give one example of such a set of elements.

33. What is Tyndall effect? Explain with an example.

34. Find the size, nature and position of image formed when an object of size 1 is placed at a

distance of 15 cm from a concave mirror of focal length 10 cm.

OR

Write laws of refraction. Explain the same with the help of ray diagram, when a ray of light passes through a rectangular glass slab.

35. The diagram shows modes of asexual reproduction in animals.

Binary Fission	Multiple Fission	Budding	Regeneration	Spore Formation

Using the above diagram, answer the following questions:

   i. Name one organism each which reproduces by binary fission and multiple fission.

  ii. What is the difference between binary fission and multiple fission?

 iii. How Planaria reproduces?

 iv. In which reproductive method an organism produces an outgrowth on its body surface?

  v. How Rhizopus reproduces under suitable conditions?

36. i. Explain the meanings of words "electromagnetic" and "induction" in the term electromagnetic induction. List three factors on which the value of induced current produced in a circuit depends.

  ii. Name and state the rule used to determine the direction of induced current. State one practical application of this phenomenon in everyday life.

OR

  a. Name and state the rule to find the direction of force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it.

 b. Draw a well labelled diagram of an electric motor.

Solution

Section A

1. When quicklime or calcium oxide (CaO) reacts with water, slaked lime [Ca(OH)$_2$] is formed. During this reaction a large amount of heat is released. So, this reaction is an exothermic reaction.

    CaO + H$_2$O $\rightarrow$ Ca(OH)$_2$ + Heat
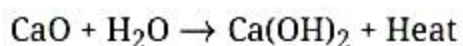
    OR

    Reactions in which two or more reactants combine to form one product are called combination reaction.

    $2Fe + 3Cl_2 \rightarrow 2FeCl_3$
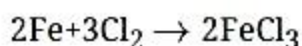
    Iron reacts with chlorine to form ferric chloride is a combination reaction.

2. Catalyst accelerates/decelerates the rate of a chemical reaction without itself being consumed in the reaction.

3. (d) 6

    Explanation: The number of C-H bonds in ethane (C$_2$H$_6$) molecule is 6. Carbon is tetravalent. Each carbon atom forms 3 single bonds with 3 hydrogen atoms.

4. Yes, a plane mirror can be called a spherical mirror because it also obeys the laws of reflection just like the spherical mirror . The only difference is that the reflecting surface of spherical mirror is curved while that of plane mirror is straight having infinite focal length and infinite centre of curvature. It can be **called a spherical mirror** of radius of curvature equal to infinity.

5. The phenomenon responsible for increasing the apparent length of the day by 4 min is **atmospheric refraction.**

6. When an electric current is passed through an aqueous solution of an acid, hydrogen is produced at cathode.

    OR

Tomato is Acidic. Tomatoes are generally considered a high acid food item with a pH 4.1.

7. We are given, I = 0.5 A; t = 10 min = 600 s.

we have,

Q = I × t

= 0.5 A × 600 s

= 300 C

Hence, the amount of electric charge that flows through the circuit is 300 C

8. The divergence of magnetic field lines indicates the decrease in strength of the magnetic field near the ends of the solenoid.

9. $R_s = 0.2 + 0.3 + 0.4 + 0.5 + 12 = 13.4\Omega$

$I = \dfrac{V}{R} = \dfrac{9}{13.4} = \dfrac{90}{134}$ or or I = 0.6716A

When in series, the current passing through each resistor is equal to the current in the circuit.

∴ Current through 12Ω = 0.6716 A

OR

Voltmeter measures potential difference.

10. Amoebas can be found in fresh water, salt water, soil and in some animals - including humans. They feed off bacteria, algae and other protozoa.

11. Leaves show following adaptations for photosynthesis:
    a. Flat surface to allow greater exposure to sunlight
    b. Presence of chlorophyll to trap solar energy
    c. Larger number of stomata on lower surface

OR

    a. Blood vascular system
    b. Lymphatic system

12. Many practices are introduced at wide scale to reduce, reuse and recycle the waste products now a days, in order to keep environment clean and sustaining, two of them are,
    i. Composting, collecting and dumping of biodegradable waste in a pit to produce manure.
    ii. Biogas can be produced by the processing of waste products, which can be used as a

source of energy in farms.

OR

We should eat plants to get more calories of heat.

13. Glucose and oxygen are the end products of photosynthesis.

14. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

15. (a) A is false but R is true.

OR

(b) Both A and R are true but R is not the correct explanation of the assertion.

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

17. i. (d) conversion of pyruvate to lactic acid

    ii. (c) Only Carbon dioxide(yes)

    iii. (a) Lack of oxygen

    iv. (b) To stop air from getting in

    v. (a) Milky

18. i. (a) - Blue

    ii. (c) - Plaster of Paris

    iii. (a) - Five

    iv. (d) - $CaSO_4.1/2H_2O$

    v. (b) - gypsum

19. i. (d) 30 Ω

    ii. (d) all of these

    iii. (a) resistance decreases

    iv. (b) $10^{-8}\,\Omega m$ to $10^{-6}\,\Omega m$

    v. (b) Alloys does not oxidise readily at high temperature

20. i. (d) stong electrostatic force

    ii. (b) transfer of electron

    iii. (d) both (a) and (b)

    iv. (b) 18

    v. (b) Electrical conductivity in solid state

Section B

21. Common features of respiratory organs in aquatic and terrestrial animals are:
    - Large surface area for exchange of gases.
    - Thin-walled for easy diffusion.
    - Rich supply of blood for transport of gases.

OR

The tracheal wall is supported by 'C' - shaped cartilaginous rings because they prevent the trachea from collapsing.

22. High temperature inhibits photosynthetic action as the enzymes associated with photosynthesis can function only at optimum temperature. At high temperature the enzymes get denatured.

23. The organic compound A which is a constituent of many medicines and act as antifreeze with the molecular formula C_2H_6O is ethanol (CH_3CH_2OH). Ethanol is oxidised to ethanoic acid (B) upon reaction with alk. $KMnO_4$.

$$\underset{\underset{A}{Ethanol}}{CH_3CH_2OH} \xrightarrow{Alk.\ KMnO_4 + Heat} \underset{Ethanoic\ acid}{CH_3COOH}$$
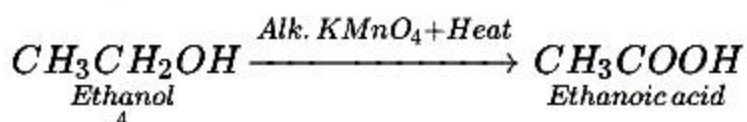
24. i. Sprinkling common salt on icy roads, ice/snow lowers the freezing point of ice due to which the ice or snow melts down. The softened ice/snow can be easily cleared from the roads.

    ii. Calcium chloride can be used in place of common salt. It can lower the freezing point up to -55°C.

    iii. The students are caring, helping, have supporting nature and have scientific knowledge.

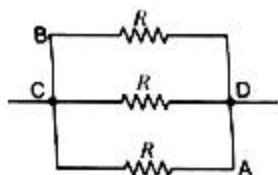25. Here $^nD_a = 2.5$, $^ng_a = 1.5$, $V_g = 2 \times 10^8$ ms^{-1}; $V_D = ?$

    $^nD_a = \frac{^nD_a}{^ng_a}$, $^nD_a = \frac{2.5}{1.5} = \frac{5}{3}$ But $^nD_a = \frac{V_g}{V_D}$

    Therefore $\frac{V_g}{V_D} = \frac{5}{3}$

    $\therefore V_D = \frac{3}{2} \times 2 \times 10^8 = 1.2 \times 10^8 ms^{-1}$

26. The point C is connected to B and the point D is connected to A. Therefore, three identical resistors, each having resistance R, are connected in parallel and the equivalent circuit diagram is shown in the figure. If the equivalent resistance is R then

$$\frac{1}{R'} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R}$$

$$= \frac{3}{R}$$

$$\Rightarrow R' = \frac{R}{3}$$

27. i. In first generation progeny (F_1 progeny) all plants with round seeds.

   ii. In second generation progeny (F_2 progeny) all plants with round and wrinkled seeds.

   iii. (i) Tall and drawrf plants.

   (ii) Yellow and green seeds.

   (iii) White and purple flowers.

OR

   i. Acquired traits are those characteristics which an individual develops during its lifetime due to the effect of environmental factors. These traits are not inheritable.

   ii. Inherited traits are those features, which are genetically transmitted from parents to their offsprings and which cannot be varied by environmental factors.

   iii. Professional ethics and social responsibility are the values shown by the doctor.

28. i. The primary consumers are the organisms who directly feed on the producers. In the given food web, rabbits and mice are the primary consumers.

   ii. The foxes feed on the rabbits and mice. If all the foxes are killed then there will be no direct predator of rabbits and mice, hence the number of rabbits and mice will increase in the given ecosystem and with increasing number of primary consumers the producers will decline as more comsumers will feed on more producers, which will disturb the ecological balance.

29. Digestive enzymes break-down the various complex components of food into simple and soluble form so that they can be absorbed and assimilated by the body easily.

30. Carbohydrates are found in fruit, vegetables, grains and other starches. Digestion for carbohydrates actually starts in the mouth. Enzymes in saliva begin to break down carbohydrates. Carbohydrates travel through the esophagus, stomach and enter the small intestine.

In the small intestine, carbohydrates get further broken down into single carbohydrate

units called monosaccharide. These single molecules get absorbed across the intestine wall and are sent through the blood stream. Carbohydrate in the blood is in the form of a monosaccharide called glucose.

The more carbohydrate eaten at one time, the more glucose is going to be released into the blood after digestion.

31. i. Neon (Ne)and argon (Ar) contain completely filled valence shells, hence their valency is zero. Both are monoatomic gases.

    ii. These elements do not possess any tendency to lose or gain electrons due to fully filled outer most shells. Thus, both are non-reactive monoatmic gases.

32. Since., The given three elements A, B and C with similar properties have atomic masses X, Y and Z respectively and mass of Y is approximately equal to the average mass of X and Z. Therefore, this arrangement of elements in which the atomic mass of middle element is almost the mean of atomic masses of first and third elements is known as Dobereiner's triads.

    e.g. Ca (Atomic mass = 40), Sr (Atomic mass = 88) and Ba (Atomic mass = 137)

    Atomic mass of Sr = $\frac{40+137}{2}$ = 88.5

    Other example is Li(7), Na (23) and K (39).

33. The scattering of the light by particles, that it encounters in its path, is called Tyndall effect. When a beam of light enters a smoke-filled dark room through a small hole, then its path becomes visible to us. The tiny dust particles present in the air of room scatter the beam of light all around the room. Thus, scattering of light makes the particles visible. Tyndall effect can also be observed when sunlight passes through a canopy of a dense forest, where, the tiny water droplets in the mist scatter the light.

34. Object distance, u = - 15 cm

    Focal length, = - 10 cm

    Object size, h = 1 cm

    Image distance, v= ?

    i. Position of image

    From mirror formula, $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

    We have, $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

    Putting values, we get $\frac{1}{v} = \frac{1}{-10} - \frac{1}{-15}$

    $= \frac{-3-(-2)}{3} = -\frac{1}{30}$

    The image is formed at a distance 30 cm on the side of the object Negative sign

indicates that object and image are on the same side.

ii. Nature of image: The image is in front of the mirror, its nature is real and inverted.

Size of image: From the expression for magnification,

$$m = \frac{h'}{h} = -\frac{v}{u}$$

We have $h' = -h \times \frac{v}{u}$

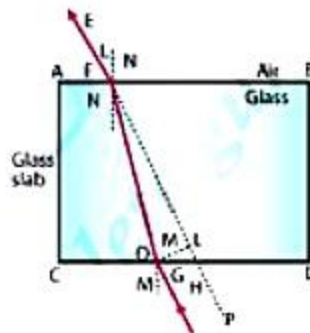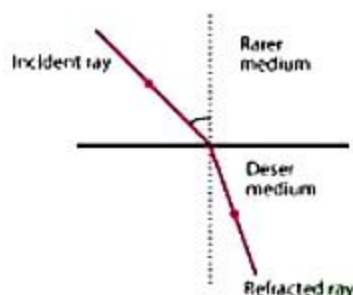putting values, we get $h' = -1 \times \frac{-30}{-15}$

$= -2$

The image formed has size 2 cm and negative sign means inverted and real and enlarged.

OR

Laws of refraction are as follows:

i. Incident ray, refracted ray and normal at the point of incidence lie in the same plane.

ii. Ratio of sine of incidence and sine of refraction is constant for the given color and pair of media.

35. i. Amoeba reproduces by binary fission and Plasmodium reproduces by multiple fission.

ii. Fission in which the parent cell divides to form two similar daughter cells is called binary fission whereas fission in which the parent cell divides to produce more than two daughter cells is called multiple fission.

iii. Planaria reproduces by regeneration in which an organism is split into several parts, most of the parts will develop into complete organisms.

iv. In budding, an organism produces an outgrowth on its body surface, which then matures and develops into a new individual.

v. In Rhizopus, the thick-walled spores have the capacity to develop into new individuals under suitable conditions.

36. The word "electromagnetic" is related to the interrelation between electric current I and magnetic field B. While "Induction" is the process of giving rise to something. So the process of generation of an electric current I from magnetic effects B is called electro-magnetic induction.

Three factors which affects the electro-magnetic induction are:

i. The number of turns in a coil

ii. The strength of magnet used and

iii. The speed by which magnet is pushed into the coil.

Fleming's right-hand rule used to determine the direction of induced current.

Electric generator is based on the principle of electromagnetic induction.

OR

a.
- Fleming's left-hand rule.
- Adjust your hand in such a way that the forefinger points in the direction of magnetic field and the centre finger points in the direction of current, then thumb gives the direction of force acting on the conductor

b. Electric motor.