

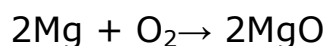
## Sample Paper Class 10 CBSE 2020-21

### **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 - a question no. 1 to 20 - all questions and parts there 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 - a question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.
- (iv) Section-C - a question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be 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. Identify the substance oxidized and reduced in the chemical reaction:

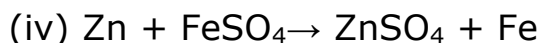
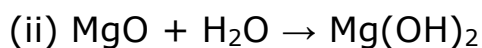
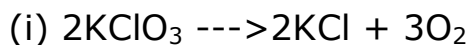


**OR**



In which period and group would you place the elements with the following electronic configurations: 2,8

- Describe the process of neutralization with the help of an example.
- Which of the following are combination reactions?



- (i) and (iii)
  - (iii) and (iv)
  - (ii) and (iv)
  - (ii) and (iii)
- The energy given to a fundamental charge accelerated through a potential difference of 1 V is equal to
    - $1.6 \times 10^{-19}$  J
    - $6 \times 10^{-19}$  J
    - 1 eV
    - Both A and C
  - Raghav was asked to arrange five identical  $5 \Omega$  resistors such that the equivalent resistance of the combination should be minimum. In what possible ways should he connect the resistors?
  - Why don't magnetic field lines intersect?

OR

Why is the current in a generator AC?

- A clock hung on a wall has marks instead of numerals on its dial. On the adjoining wall, there is a plane mirror and the image of the clock in the mirror indicates the time 3:25. What is the time on the clock?



8. A lemon is kept in a flag tumbler with water. How does it appear due to the refraction of light?
9. The human eye can focus on objects at different distances by adjusting the focal length of the eye-lens. Which part of our eye helps in doing this?

OR

An old person is unable to see clearly nearby objects as well as distant objects. To correct the vision, what kind of lens will he require?

10. Name the raw materials which are essential to carry out the process of photosynthesis in plants.
11. State **True** or **False** for the following statement - Yeast reproduces asexually by spore formation.

(OR)

State **True** or **False** for the following statement - Breakdown of proteins takes place first in the mouth.

12. Name the final major products that are formed when the bacteria *Lactobacillus* performs anaerobic respiration in the milk.

(OR)

A healthy person went to a clinic to check his Blood pressure. The doctor used a \_\_\_\_\_ to measure his blood pressure and the readings were found out to be \_\_\_\_ mmHg (Systole) and \_\_\_\_ mmHg (Diastole).

13. In an ecosystem, 10% of the energy available for transfer from one trophic level to the next is in the form of:
  - A. heat energy
  - B. light energy
  - C. chemical energy
  - D. mechanical energy
14. In the following Questions, the Assertion and Reason have been put forward. Read the statements carefully and choose the correct alternative from the following:  
Assertion:  $Al_2O_3$  is an amphoteric oxide.

Reason:  $\text{Al}_2\text{O}_3$  reacts with acid as well as a base to form salt and water.

- A. Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
  - B. The Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.
  - C. The Assertion is true but the Reason is false.
  - D. The statement of the Assertion is false but the Reason is true.
15. Assertion: DNA is the genetic material in most living organisms.  
Reason: Viruses would not be able to infect humans if they had RNA as genetic material.
- A. Both A and R are true, and R is the 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: Asexual Reproduction is more prevalent in lower organisms.  
Reason: It leads to faster production of progenies with a lesser amount of energy spent.
- A. Both A and R are true, and R is the 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.
17. Read the following and answer any **four** questions from 17 (i) to 17 (v)
- Plants show an Autotrophic mode of nutrition, while most animals show a Heterotrophic mode of nutrition. We eat various types of food that have to pass through the same digestive tract. Naturally the food has to be processed to generate particles which are small and of the same texture. This is achieved by crushing the food with our teeth. We take the food through our mouth and then absorb the



nutrients in it after complete digestion inside our digestive tract. Left-over undigested food is egested out of the body through the Anus.

(i) What mode of nutrition is observed in humans?

- A. Autotrophic
- B. Saprophytic
- C. Holozoic
- D. Parasitic

(ii) Proteins in our food is digested by which of the following set of enzymes:

- A. Ptyalin and Pepsin
- B. Pepsin and Trypsin
- C. Trypsin and Ptyalin
- D. Pepsin and Lipase

(iii) The food left undigested in our digestive tract is passed out through the Anus. This form of undigested food is known as

- A. Bolus
- B. Chyme
- C. Urine
- D. Feces

(iv) *Amoeba* and *Chlamydomonas* are unicellular organisms. What is the contrasting point in between the two?

- A. *Amoeba* is Autotrophic; while *Chlamydomonas* is Holozoic
- B. *Amoeba* is eukaryotic while *Chlamydomonas* is Prokaryotic
- C. *Amoeba* is Heterotrophic; while *Chlamydomonas* is Autotrophic
- D. *Amoeba* is Holozoic; while *Chlamydomonas* is Heterotrophic

(v) The longest part of the small intestine is the

- A. Duodenum
- B. Jejunum
- C. Ileum
- D. Colon

18. Read the following and answer any **four** questions from 18 (i) to 18 (v)

Atoms of eight elements A, B, C, D, E, F, G, and H have the same number of electronic shells but the different number of electrons in their outermost shell. It was found that elements A and G combine to form an ionic compound. This compound is added in a small amount to almost all vegetable dishes during cooking. Oxides of elements A and B are basic in nature while those of E and F are acidic. The oxide of D is almost neutral. Based on the above information answer the following questions:

18. (i) To which group or period of the periodic table do the listed elements belong?  
(ii) What would be the nature of the compound formed by a combination of elements B and oxide of element F?  
(iii) Which two of these elements could definitely be metals?  
(iv) Which one of the eight elements is most likely to be found in a gaseous state at room temperature?  
(v) If the number of electrons in the outermost shell of elements C and G is 3 and 7 respectively, write the formula of the compound formed by the combination of C and G.
19. Ohm's Law defines the relationships between (E)voltage, (I) current, and (R) resistance. One ohm is the resistance value through which one volt will maintain a current of one ampere.
- I. Voltage is the difference in electrical potential between two points in a circuit. It's the push or pressure behind current flow through a circuit and is measured in (V) volts.
- II. Resistance determines how much current will flow through a component. Resistors are used to control voltage and current levels. A very high resistance allows a small amount of current to flow. Very low resistance allows a large amount of current to flow. Resistance is measured in ohms.
- III. Power is the number of current times the voltage level at a given point measured in wattage or watts
- (i) Which of the following statements does not represent ohm's law?  
A. current / potential difference = constant  
B. potential difference / current = constant  
C. potential difference = current x resistance



D. current = resistance x potential difference

(ii) The unit of current is

- A. ampere
- B. watt
- C. volt
- D. coulomb

(iii) The potential difference required to pass a current 0.2 A in a wire of resistance  $20 \Omega$  is

- A. 100 V
- B. 4 V
- C. 0.01 V
- D. 40 V

(iv) Two resistances of  $100 \Omega$  and  $0 \Omega$  are connected in parallel. The overall resistance will be

- A.  $100 \Omega$
- B.  $50 \Omega$
- C.  $25 \Omega$
- D. zero ohm

(v) Three resistors  $2 \Omega$ ,  $3 \Omega$  and  $4 \Omega$  are connected so that the equivalent resistance is  $9 \Omega$ . the resistors are connected

- A. all in series
- B. all in parallel
- C.  $2 \Omega$  and  $3 \Omega$  in parallel and the combination in series with  $4 \Omega$
- D.  $2 \Omega$  and  $3 \Omega$  in series and the combination in parallel to  $4 \Omega$

20. The electric generator is a machine for producing an electric current. The electric generator or dynamo converts mechanical energy into electrical energy. The generator is an application of electromagnetic induction. It works on the principle that when a wire is moved in a magnetic field, then the current is induced in the coil. A rectangular coil is made to rotate rapidly in the magnetic field between the poles of a horseshoe-type magnet. When the coil rotates, it cuts the lines of magnetic force, due to which a current is produced in the

generator coil. This current can be used to run various electrical appliances.

- (i) An electric generator actually acts as
- A. source of electric charge
  - B. source of heat energy
  - C. an electromagnet
  - D. a converter of energy
- (ii) Electromagnetic induction is the
- A. charging of a body with a positive charge
  - B. production of current by relative motion between a magnet and a coil
  - C. rotation of the coil of an electric motor
  - D. generation of magnetic field due to a current-carrying solenoid
- (iii) The brushes used in electric generator is made of which material
- A. Carbon
  - B. Aluminium
  - C. Zinc
  - D. Soil iron
- (iv) A commutator changes the direction of current in the coil of
- A. a DC motor
  - B. a DC motor and an AC generator
  - C. a DC motor and a DC generator
  - D. an AC generator

### Section-B

21. What is meant by a trophic level?

**(OR)**

How will you define the gene of a particular protein?

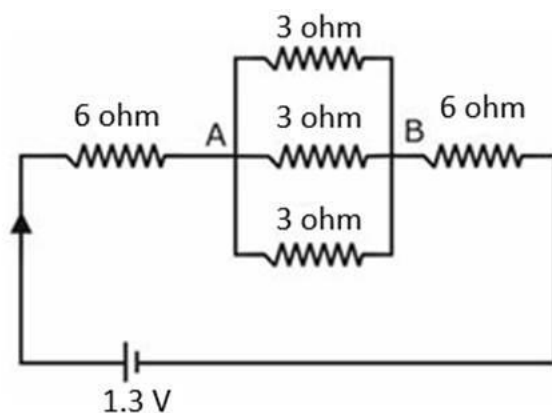
22. What is meant by blood pressure?



23. How does the electropositive character of elements in a period vary from left to right?

(OR)

- (i) How many groups and periods are present in the modern periodic table? **(1)**
- (ii) What is the main difference between Mendeleev's and modern periodic law? **(1)**
24. What is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds?
25. Determine the power consumed in the circuit shown



26. A current-carrying straight wire is kept along the axis of a circular loop carrying a current. What is the force exerted by the magnetic field of straight wire on the circular loop?

### Section-C

27. How do autotrophs obtain  $\text{CO}_2$  and  $\text{N}_2$  to make their food?

(OR)

Differentiate between aerobic and anaerobic respiration.

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

29. Briefly describe the double circulation in human beings.

30. What is observed when: **(1×3)**

(i) Potassium iodide is added to aqueous lead nitrate



- (ii) Identify the type of reaction  
(iii) Give a balanced chemical equation for this.
31. Explain why: (1×3)
- An antacid tablet is taken when you suffer from acidity.
  - Calamine solution is applied on the skin when an ant bites.
  - Factory waste is neutralised before disposing of it in the water bodies.
32. Write the electron-dot structure for Na and Cl atoms. How do these form a chemical bond? Name the type of bond so formed. Why does a compound so formed have a high melting point?
33. If an object of height 4 cm is placed at a distance of 12 cm from a concave mirror having a focal length of 24 cm, find the position, nature and the height of the image.

### Section-D

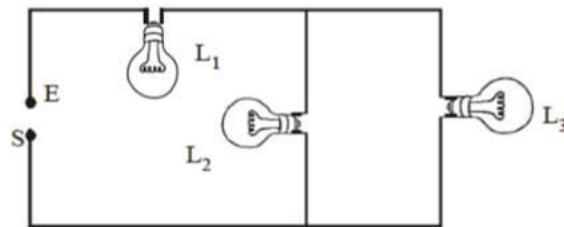
34. (i) Ammonia is found in many household products, such as window cleaners. It turns red litmus blue. What is its nature? (3)
- (ii) What are Double displacement reactions? Give two examples. (2)
- (OR)**
- (i) Three liquids are given to you. One is hydrochloric acid; another is sodium hydroxide and the third is a sugar solution. How will you identify them? You have only turmeric which you could use as an indicator. (3)
- (ii) Blue litmus paper is dipped in a solution. It remains blue. What is the nature of the solution? Explain. (2)
35. How are modes for reproduction different unicellular and multicellular organisms? How does reproduction help in providing stability to the population of species?



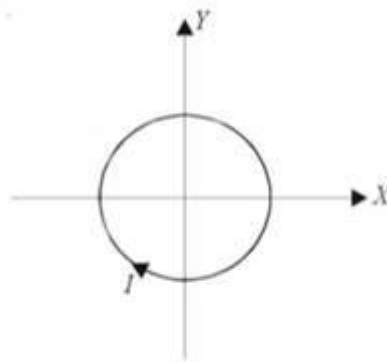
36. (a) A slide projector is to project a (40 mm x 20 mm) slide on a 4 m x 4 m screen. Find the focal length of the convex lens used if the screen is 10 m away from the lens. (3)
- (b) Which of the following mirrors or lenses could produce a virtual image? Explain. (2)
- Concave lens
  - Convex lens
  - Convex mirror

OR

- (a) In the figure, three similar lamps  $L_1$ ,  $L_2$ , and  $L_3$  connected across a power supply. If the Lamp  $L_3$  fuses, how will the light emit by  $L_1$  and  $L_2$  change? (3)



- (b) A conducting loop carrying a current  $I$  is placed in a uniform magnetic field pointing out of the plane as shown in the Figure. Determine whether the loop will tend to expand or contract and give a reason for your answer. (2)



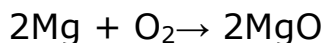
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## Hints & Solutions

### Section A

1. **Solution:**  $O_2$  is an oxidizing agent and Mg is a reducing agent



In the given reaction,  $O_2$  is reduced by losing oxygen atoms. Thus,  $O_2$  is an oxidizing agent as it undergoes reduction.

Mg is oxidized by gaining oxygen atoms. Thus, Mg is a reducing agent as it undergoes oxidation.

OR

**Solution:** The electronic configuration is 2,8. It means that the given element contains 2 electrons in the K shell and 8 electrons in the L shell. Thus, the element contains 2 shells. Thus it belongs to the second period. Secondly, there are 8 electrons in the valence shell (completely filled) which is true for the 18<sup>th</sup> group.

2. **Solution:** The reaction between an acid and a base is known as neutralization. Neutralization reaction results in the formation of salt and water. During this reaction, energy in the form of heat is evolved.



Example: When sodium hydroxide (NaOH) is added to hydrochloric acid (HCl), sodium chloride (NaCl), and water are obtained.

3. **Answer (D):** In reaction (ii),  $MgO + H_2O \rightarrow Mg(OH)_2$

MgO and water combined together to form a single product, i.e., magnesium hydroxide.



Aluminum combines with oxygen to form a single product. i.e. aluminum oxide.

Hence, both are examples of combination reactions.



4. **Answer (D):** On the sub-microscopic scale, it is more convenient to define an energy unit called the electron volt (eV), which is the energy given to a fundamental charge accelerated through a potential difference of 1 V. In equation form,

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ C} \times 1 \text{ V} = 1.6 \times 10^{-19} \text{ J/C}$$

Therefore, option D is correct.

5. **Solution:** The parallel combination of the identical resistances is always the least of all the possible combinations.
6. **Solution:** If magnetic field lines would intersect, there would be two directions of magnetic fields at that point, which is not possible

OR

The rotation of the generator causes the coil to periodically reverse the polarity of the current which produces alternating current

7. **Solution:** The time observed in the mirror would be inverted due to inverted images of the hands of the clock. In the real clock, the time would be at a difference of 12 hours, hence the time will be 8:35
8. **Solution:** A lemon kept in a glass tumbler containing water would appear larger due to the refraction of light. As light travels from the air (rarer) to the water (denser) medium, it bends towards the normal. Due to this lemon would appear larger.
9. **Solution:** The human eye can focus on objects at different distances by adjusting the focal length of the eye-lens. The ciliary muscles change the focal length by stretching or contracting the eye lens, thereby changing the radius of curvature of the lens.

OR

The upper portion (concave lens) facilitates the distant vision and the lower portion (convex lens) facilitates near vision. Hence, a bifocal lens should be used, whose upper portion is the concave lens and lower portion is a convex lens

10. **Answer:** Water, Carbon Dioxide, and Sunlight.
11. **Answer:** False. Yeast reproduces by Budding. Multicellular fungi like *Penicillium* reproduce asexually by Spore formation.

(OR)



State **True** or **False** for the following statement - Breakdown of proteins takes place first in the mouth.

Answer: False. Proteins begin to breakdown in the stomach as Pepsin is released here. In the mouth, the starch starts to break down with the action of salivary amylase.

12. **Answer:** Lactic Acid and  $\sim 2$  ATPs.

(OR)

**Answer:** Sphygmomanometer; 120 mmHg (Systole) and 80 mmHg (Diastole)

13. **Answer (B):** Energy available for transfer to the next level is in the form of food which is a form of chemical energy.
14. **Answer (A):** Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
15. **Answer (C):** DNA is the genetic material in most living organisms, except a few Viruses. Some RNA viruses like HIV (of the family *Retrovirus*) do have RNA as their genetic material but are able to infect human cells as they have the ability to convert their RNA into viral DNA by Reverse Transcription.
16. **Answer (A):** Asexual Reproduction is seen more frequently in lower organisms that have a simpler body organization. It requires lesser energy inputs than the sexual reproduction method. It is also a faster process of reproduction.
17. (i) **Answer (C):** Food is taken in by the mouth and is digested in the digestive system. Then the food is absorbed by the body. This mode of nutrition in humans is known as Holozoic nutrition.
- (ii) **Answer (B):** Pepsin secreted by the stomach and Trypsin by the Pancreas helps in the digestion of proteins in our food. Lipase acts on Fats, while Ptyalin or Salivary amylase acts on carbohydrates.
- (iii) **Answer (D):** After digestion of the food material taken in by ingestion through the mouth, the leftover undigested food is passed out of the digestive tract in the form of Feces through the Anus.
- (iv) **Answer (C):** *Amoeba* is a Eukaryotic organism that exhibits a Holozoic (heterotrophic) mode of nutrition. Whereas *Chlamydomonas* is a green unicellular alga (also a eukaryotic



organism) that has chlorophyll and is capable of photosynthesis; hence showing an Autotrophic mode of nutrition.

(v) **Answer (C):** Ileum is the longest part of the small intestine. The colon is the longest part of the large intestine.

18. (i) **Answer:** The listed chemicals belong to the third period; it includes Na, Mg, Al, Si, P, S, Cl & Ar.

(ii) **Answer:** Compounds formed by the combination of B (Mg) and F (S) will result in the formation of salt called  $MgSO_4$ .

(iii) **Answer:** Compound A (Na) and B (Mg) are definitely metals as their oxides are basic in nature.

(iv) **Answer:** Element H (Ar), is likely to be found in a gaseous state at room temperature as it is the 8th element of the group so it would have 8 electrons in its outermost shell which is the electronic configuration of a Noble gas.

(v) **Answer:** They will form  $AlCl_3$  (Aluminum chloride).

19. (i) **Answer (C):** According to Ohm's law

$$V = I R$$

Or we can say that

$$\text{potential difference} = \text{current} \times \text{resistance}$$

(ii) **Answer (A):** Ampere is the SI unit of current

(iii) **Answer (B):** From Ohm's law

$$V = I R$$
$$V = 0.2 \times 20 = 4 V$$

Therefore, option B is correct.

(iv) **Answer (D):** Since the other resistance is of zero Ohm, we can say that the  $100 \Omega$  resistance is short-circuited and hence the net resistance will be zero.

(v) **Answer (A):** All the resistors are connected in series, and their combination gives

$$2 + 3 + 4 = 9 \Omega$$

20. (i) **Answer (D):** An electric generator converts mechanical energy to electrical energy



- (ii) **Answer (B):** When a magnet and a coil are moved relative to each other an emf is induced in the coil which leads to the flow of current in the coil.
- (iii) **Answer (A):** Carbon brushes are used in an electric generator to connect the load to the commutator.
- (iv) **Answer (C):** Both DC motors and generators use a commutator to change the direction of current in the rotating coil.

## Section-B

21. **Answer:** The group of organisms that occupy the same level in a food chain is called a trophic level.

(OR)

**Answer:** The part of cellular DNA, which provides information regarding a particular protein, i.e. codes for that protein, is called the gene for that protein.

22. **Answer:** Blood pressure is the pressure exerted by blood against the wall of blood vessels while circulating.
23. **Answer:** The electropositive character of elements decreases in a period because of effective nuclear charge increases from left to right in a period. Due to this effective nuclear charge, the electronegativity increases, and the attraction of the nucleus on valence shell electrons also increases. So the tendency of losing electrons decreases. Hence the electropositive character of elements decreases in a period.

(OR)

**Answer:** (i) Vertical columns in the periodic table are called "groups". There are 18 such groups in the modern periodic table. Horizontal rows are called "periods". There are 7 such periods in the modern periodic table.

(ii) The main difference between Mendeleev's and modern periodic law is that Mendeleev considered the properties of elements as periodic functions of their atomic masses while modern periodic law considers the properties of elements as a periodic function of their atomic numbers.





24. **Answer.**  $-\text{CH}_2$  is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds.

25. **Answer:** The three  $3 \Omega$  resistances are in parallel, therefore,

$$\frac{1}{R} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$$

Hence,  $R = 1 \Omega$

Now this resistance is in series with the two  $6 \text{ ohm}$  resistances, then

$$R' = 6 + 1 + 6 = 13 \Omega$$

$$I = \frac{1.3}{13} = 0.1 \text{ A}$$

Now the power consumed in the circuit is

$$P = VI = 0.1 \times 1.3 = 0.13 \text{ W}$$

26. **Answer:** The magnetic field due to the straight current-carrying wire is tangential to the current-carrying circular loop. Therefore, the orientation of the magnetic field and the electric current at any point on the loop is  $0^\circ$ . A current-carrying conductor experiences no force due to the magnetic field if the field is parallel or antiparallel to the direction of the current flowing in the conductor.

### Section-C

27. **Answer:** Autotrophs have the ability to make their own food by the process of photosynthesis. They obtain carbon dioxide from the atmosphere through the stomata. Nitrogen, an essential element in the synthesis of proteins, is taken up from the soil in the form of nitrates (converted from atmospheric  $\text{N}_2$  by *Rhizobia* or ammonia).

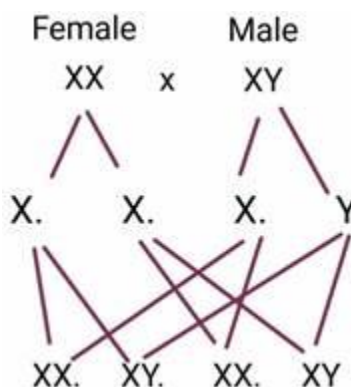
**(OR)**

**Answer:**



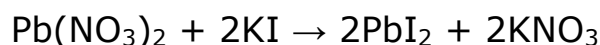
AEROBIC RESPIRATION	ANAEROBIC RESPIRATION
Occurs in mitochondria of cells.	Occurs in cytoplasm of cells.
Occurs in presence of oxygen and releases lot of energy.	Occurs in absence of oxygen and releases small energy.
The end products are carbon dioxide and water.	The end products are ethyl alcohol/lactic acid and carbon dioxide.
Occurs in most of the plants and animals	Occurs in yeast, bacteria etc.

28. **Answer:** The sex of a child in human beings is genetically determined. Humans have 23 pairs of chromosomes, out of which 22 are a perfect pair of one paternal and one maternal copy. The last pair of chromosomes also called the sex chromosomes, is different for males and females. Females have a pair of X chromosomes, whereas males have XY chromosomal pairs. The inheritance of these sex chromosomes that determine the gender of an individual is as follows:



29. **Answer:** Double circulation is the process of blood flow through the heart twice. Deoxygenated blood from the body is returned to the heart from where it is pumped to the lungs. Lungs purify the blood and the oxygenated blood from the lungs returns back to the heart and is pumped to the body via the aorta.
30. **Answer:** (i) When potassium iodide is added to aqueous lead nitrate, it forms potassium nitrate and a precipitate of lead iodide which is yellow.

The reaction that takes place is:

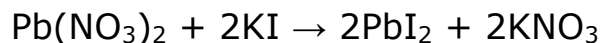


Note: The insoluble substance formed is known as a precipitate.  
Precipitate settles down at the bottom of the test tube.

(ii) The type of reaction is double displacement reaction or precipitation reaction.

Any reaction that produces a precipitate can be called a precipitation reaction.

(iii) The balanced chemical equation is:

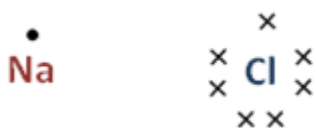


31. **Answer:** a. Antacid is a substance that neutralizes the acidity in the stomach because it contains bases. We take antacids such as milk of magnesia, which contains magnesium hydroxide. These bases react with an excess acid released in the stomach and neutralize their effects, thus giving us relief.

b. The sting of an ant contains formic acid. When an ant bites, it injects the formic acid into the skin which causes the burning sensation. The effect of an acid can be neutralized by applying a base to it. Thus, applying a calamine solution that contains a base called zinc carbonate will neutralize the formic acid and relieves us from the pain.

c. The wastes of many factories contain acids. If they are directly disposed into water then, the water will become acidic and it will harm aquatic life. The acid can even kill the fish and the organism underwater. Hence, these factory wastes are neutralized with basic substances before disposing to water bodies.

32. **Answer:** The reactivity of the elements is determined by the tendency to have a completely filled valence shell. The electron dot structure of Na (sodium) and Cl (chlorine) atoms are shown in the figure below.



Electron dot structure of Na and Cl



To attain a completely filled valence shell, Na has to lose the outermost electron, and Cl needs one electron to complete the valence shell.

By losing an electron, Na becomes  $\text{Na}^+$  (cation) and this electron is accepted by Cl to form  $\text{Cl}^-$  (anion). The oppositely charged ions attract each other and form NaCl. They are held together by strong electrostatic forces of attraction. The bond existing between them is called an ionic bond.

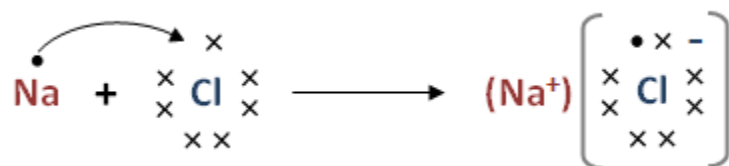


Figure: Formation of sodium chloride

Since the interionic forces are very strong, it requires a considerably large amount of energy to break the bond. Hence, ionic compounds have a high melting point.

33. **Answer:** The object is at a distance of 12 cm in front of the mirror. Using mirror formula

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

$$\frac{1}{-12} + \frac{1}{v} = -\frac{1}{24}$$

$$v = 24 \text{ cm}$$

The object has a height of  $h = 4 \text{ cm}$ , therefore

Magnification

$$m = -\frac{v}{u} = -\frac{24}{-12} = 2$$

Also

$$m = \frac{h'}{h} = 2$$

$$h' = 2 \times 4 = 8 \text{ cm}$$

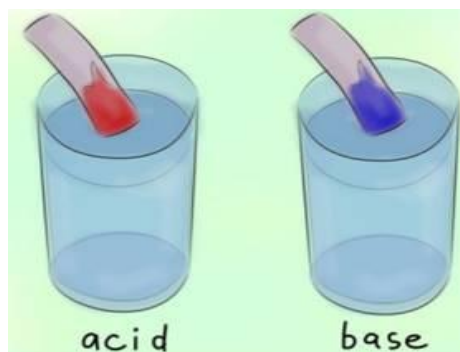
Therefore, the image is formed at 24 cm behind the mirror. It is virtual with a height of 8 cm.



## Section-D

34. **Answer:** (i) The substances that turn red *litmus*\* to blue are basic in nature. Ammonia also turns red litmus to blue. Thus, it is basic in nature.

*litmus*\*: Litmus is a dye that becomes red in acidic conditions and blue under alkaline conditions as shown in the pic below:



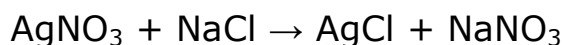
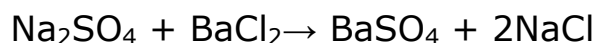
- (ii) The reaction in which there is an exchange of ions between the reactants takes place is called a double displacement reaction.



A and C are Cations (Positive Ions)  
B and D are Anions (Negative Ions)

Double Displacement Reaction

For example:



(OR)

**Answer:** (i) Turmeric is a natural indicator. Turmeric solution turns red when it comes in contact with bases. It is not affected by acids and neutral substances.

Applying turmeric solution to the test tube, the results are: -

- (1) test tube A (Hydrochloric acid): No change will happen since turmeric is not affected by acids and HCl is an acid



- (2) test tube B (sodium hydroxide): Yes, turmeric will change its colour to red since sodium hydroxide is basic in nature.
- (3) test tube C (sugar solution): No change will happen as sugar solution is neither basic nor acidic in nature.

Hence, we can only identify a basic solution using turmeric as an indicator

(ii) The blue litmus paper is an indicator that turns red when coming in contact with an acidic solution with  $\text{pH} < 4.5$  since blue litmus paper does not change its color when placed in contact with a solution this means that solution is either basic or neutral in nature.

35. **Answer:** Unicellular life forms mostly replicate by asexual reproduction like binary fission, fragmentation, regeneration, spore formation, etc. Multicellular forms may utilize both asexual and sexual strategies for reproduction, depending upon the complexity of the organism.

As in the higher multicellular organisms, copying each of the specialized cells is not possible, they resort to the production of gametes that fertilize and form a zygote (sexual reproduction) that will divide and form each of those specialized cells as it grows. On the other hand, unicellular organisms can easily and rapidly produce their copies by asexual reproduction, hence it is observed frequently in them.

Each species needs to continually struggle for its survival. Characteristic predators and fancies of nature continue expelling a huge segment of the number of inhabitants in a specific animal type. In addition, the normal cycle of life and passing additionally expels a segment of the population. Hence, reproduction is required to enable the continuity of species.

36. **Answer:** (a) To fit the slide on the screen the longest dimension of the slide should be able to fit on the screen. Therefore, the numerical value of magnification required to be produced by the lens should be

$$m = \frac{400}{4}$$
$$m = \frac{v}{u} = \frac{10}{u}$$



$$\Rightarrow \frac{10}{u} = 100$$

$$u = 0.1 \text{ m}$$

Now from the lens formula

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

$$\frac{1}{10} + \frac{1}{0.1} = \frac{1}{f}$$

$$\frac{1}{f} = 10.1$$

$$f = 0.099 \text{ m}$$

$$f = 9.9 \text{ cm}$$

(b) A virtual image is produced when the ray appears to meet at some point behind the mirror. A concave lens and convex mirror always produce a virtual image irrespective of the position of the object.

A convex lens forms a virtual image when the object is kept in between the focus and the optical centre

Therefore, all of the given options can produce a virtual image

OR

(a) Let  $R$  be the resistance of each lamp. Lamp  $L_2$  and  $L_3$  are in parallel having an equivalent resistance of

$$\frac{1}{\frac{1}{R} + \frac{1}{R}} = \frac{R}{2}$$

Now, this combination is in series with Lamp  $L_1$ , then, the combination is

$$R + \frac{R}{2} = \frac{3R}{2}$$

Then the net current flowing through the circuit is

$$I = \frac{2V}{3R}$$

The current will be divided, into two equal parts between the two lamps  $L_2$  and  $L_3$ , and the current in each of them will be



$$I' = \frac{V}{3R}$$

When  $L_3$  is fused, net current flows that through  $L_1$  through  $L_2$  will be

$$I = \frac{V}{R + R} = \frac{V}{2R}$$

Then, the current through  $L_1$  is decreased and through  $L_2$  increases. This means that the brightness of bulb  $L_1$  decreases and  $L_2$  increases.

(b) To determine the direction of the force on the loop, we can consider a small part of the loop. This small part can be considered as a nearly straight conductor, which is placed perpendicular to the magnetic field. Now from Fleming's left-hand rule, we can determine that the force on this small conductor will be towards the centre of the loop along the radius.

The loop can be considered as made up of several of the small conductors on which the force is acting towards the centre along the radius. The combined effect of the force would be to contract the loop.

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