Class X Session 2024-25
Subject - Science
Sample Question Paper - 17

Time: 3 hours **Total Marks: 80**

General Instructions:

i. *All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.*
ii. *Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.*
iii. *Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.*
iv. *Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.*
v. *Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.*
vi. *Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.*

SECTION - A

Select and write the most appropriate option out of the four options given for each of the questions 1-20. There is no negative mark for incorrect response.

1. Ritika added water to calcium oxide and observed that calcium oxide reacts vigorously with water to produce slaked lime, as represented by the following reaction. [1]

$CaO_{(s)} + H_2O(l) \rightarrow Ca(OH)_{2(aq)}$

This reaction can be classified as

a) Combination reaction
b) Exothermic reaction
c) Endothermic reaction
d) Oxidation reaction

Which of the following is the correct option?

a) A) and C)
b) B) and D)
c) A), C) and D)
d) A) and B)

2. During a science experiment, Anuj tests the extract of a lemon with common indicators. Which of the following reactions is most likely to occur? [1]

a) No effect on litmus paper.
b) Turns red litmus blue.
c) Turns methyl orange to red.
d) Turns colourless phenolphthalein to pink.

3. $CH_2=CH_2 + H_2 \rightarrow CH_3\text{-}CH_3$ is an example of: [1]

a) Addition reaction
b) Substitution reaction
c) Elimination reaction
d) Displacement reaction

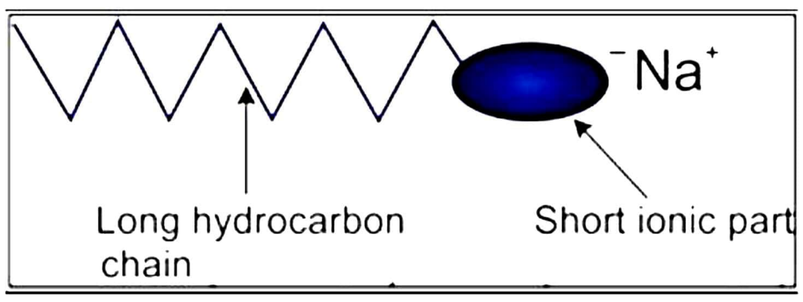
4. How many water molecules does gypsum contain? [1]

a) 2
b) 4
c) 6
d) 3

5. Sanvi notices a sharp smell coming from the bottle of acetic acid during a chemistry laboratory experiment. Her teacher asks her to identify which common substance has a similar odour. Can you help Sanvi choose the correct option? [1]

a) Vinegar
b) Kerosene
c) Glycerine
d) Rose syrup

6. Select the correct option true for below structure. [1]



	Long hydrocarbon chain	**Short ionic part**
(a)	Hydrophilic	Hydrophobic
(b)	Hydrophobic	Hydrophilic
(c)	Water soluble	Oil soluble
(d)	Oil soluble	Hydrophobic

7. A more reactive metal displaces a less reactive metal from the aqueous solution. From the following set, write which one represents a correct picture of both the possible (√) reaction and impossible (x) reactions between metals and the solution of different salts.[1]

(a)

Metal	$Al_2(SO_4)_3$	$CuSO_4$	$FeSO_4$	$ZnSO_4$
(a) Al	X	√	√	√

(b)

Metal	$Al_2(SO_4)_3$	$CuSO_4$	$FeSO_4$	$ZnSO_4$
(b) Cu	√	X	X	X

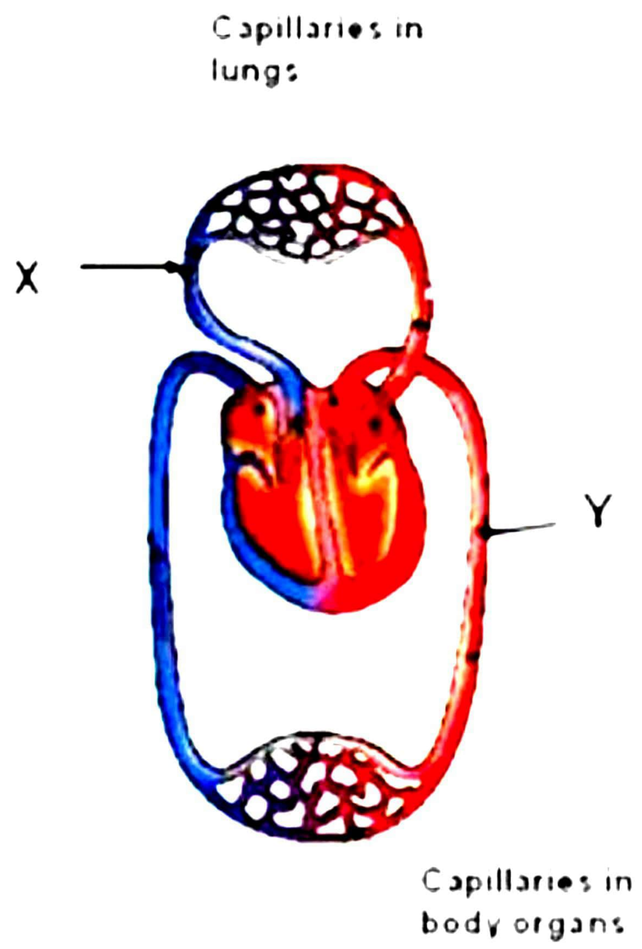
(c)

Metal	$Al_2(SO_4)_3$	$CuSO_4$	$FeSO_4$	$ZnSO_4$
(c) Fe	√	√	X	X

(d)

Metal	$Al_2(SO_4)_3$	$CuSO_4$	$FeSO_4$	$ZnSO_4$
(d) Zn	√	√	√	X

8. Select the option which gives correct identification of the parts X and Y along with their characteristic and function. [1]



a) X: Pulmonary vein - Carries deoxygenated blood from the heart to the lungs
Y: Pulmonary artery - Carries oxygenated blood from the heart to the lungs

b) X: Pulmonary vein - Carries deoxygenated blood from the heart to the lungs
Y: Aorta – Carries oxygenated blood from the heart to other parts of the body.

c) X: Pulmonary artery - Carries oxygenated blood from the heart to the lungs
Y: Pulmonary vein - Carries deoxygenated blood from the heart to the lungs

d) X: Pulmonary artery - Carries deoxygenated blood from the heart to the lungs
Y: Aorta – Carries oxygenated blood from the heart to other parts of the body.

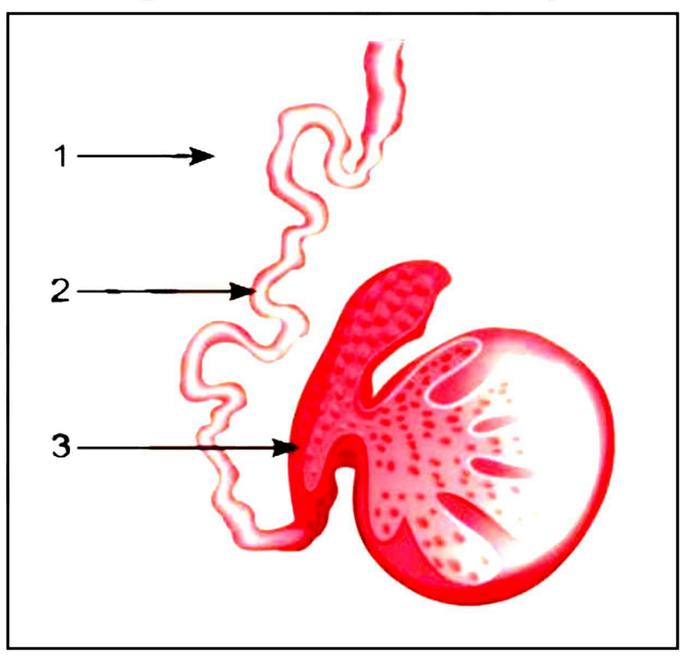
9. The stomach secretes gastric juice to assist in the process of digestion of food. Which of the following gastric components is incorrectly matched to its function? [1]

a) Hydrochloric acid : Kills harmful microorganisms
b) Mucus : Maintains alkaline environment
c) Pepsin : Breaks down proteins to peptones
d) Gastric lipase : Partially breaks down lipids

10. A pea plant which is homozygous for inflated green pods [GGII] is crossed with a homozygous plant for constricted yellow pods [ggii]. Give the phenotype and genotype of the F_1 generation. [1]

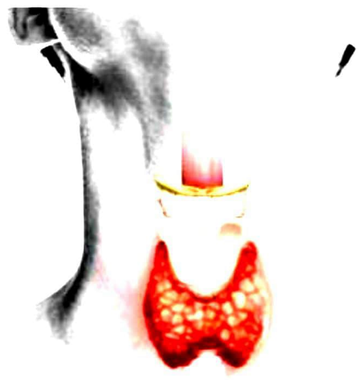
a) Inflated green pods, GgIi
b) Inflated yellow pods, Ggii
c) Constricted green pods, GGII
d) Constricted yellow pods, GgIi

11. The diagram shown below is the longitudinal section of testis of man. Which of the following is the function of part 2? [1]



a) Provides lower temperature
b) Carries sperms from the epididymis to the urethra
c) Stores sperms
d) Secretes nutrients and testosterone

12. The gland shown in the picture produces a hormone, which is responsible for the regulation of carbohydrate, fat, and protein metabolism. Which of the following diseases is caused in children due to the deficiency of this hormone? [1]



a) Addison's disease
b) Myxoedema
c) Cretinism
d) Cushing's syndrome

13. If a man is standing in front of a concave mirror between the centre of curvature and the focus, then the image formed is [1]

a) at the centre of curvature
b) at the focus
c) beyond the centre of curvature
d) between the centre of curvature and the focus

14. Which of the following statements is/are true in dispersion? [1]

I: Refractive index for violet colour is maximum
II: Deviation produced for red colour is minimum
III: The wavelength for green colour is greater than that for blue colour

a) I and II only
b) II and III only
c) I and III only
d) All the statements

15. In the given food chain, 100 J of energy is available to the lion. How much energy was available to the producers? [1]

Plants → Deer → Lion

a) 10 J
b) 1000 J
c) 10,000 J
d) 1,00,000 J

16. Matter and energy are two fundamental inputs of an ecosystem. Movement of [1]

a) Energy is bidirectional and matter is repeatedly circulating.
b) Energy is repeatedly circulating, and matter is unidirectional.
c) Energy is unidirectional and matter is repeatedly circulating.
d) Energy is multidirectional and matter is bidirectional.

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true, and R is the correct explanation of A
(b) Both A and R are true, and R is not the correct explanation of A
(c) A is true but R is false
(d) A is False but R is true

17. **Assertion(A)**: Diamond is a very hard substance. [1]
Reason(R): Each carbon atom in the diamond crystal is linked to four other carbon atoms by strong covalent bonds.

18. **Assertion (A):** Tail of the sperm consists of an acrosome and mitochondria. [1]
Reason (R): Acrosome contains enzymes which assist in fertilisation.

19. **Assertion (A):** Food chains are responsible for the entry of harmful chemicals into our bodies. [1]
Reason (R): The length and complexity of food chains vary greatly.

20. **Assertion (A):** In a circuit, the point positive terminal of battery is the point of highest potential.
Reason (R): The current flows from negative terminal to positive terminal in a circuit.[1]

SECTION - B

Question No. 21 to 26 are very short answer questions.

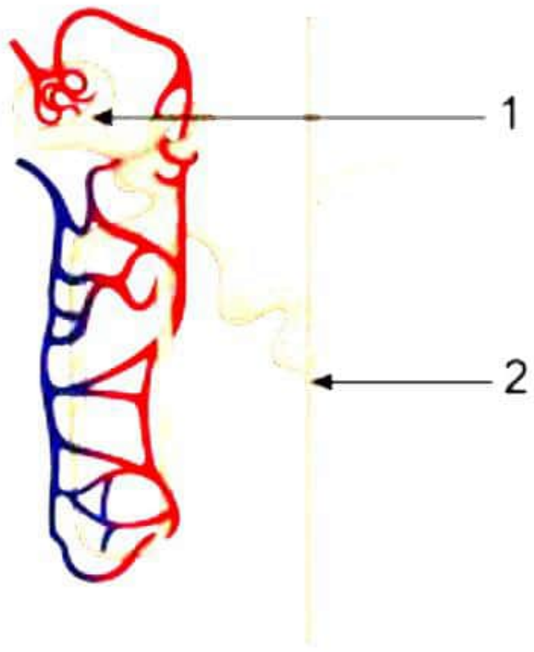
21. Subhadra noticed that some of her jewelry and copper utensils started to change colour after being left out in the air for a while. [2]

(a) What compound is formed when Subhadra's silver jewelry corrodes?

(b) What compound is formed when Subhadra's copper utensils corrode in moist air?

22. Why do multicellular organisms employ complex reproductive strategies? [2]

23. The below diagram shows a structure present in the human kidneys. [2]



(a) Identify the structure.

(b) What are liquids entering part '1' and '2' called?

OR

(a) What is the role of WBCs in the body?

(b) Abnormally, a large number of WBCs in the blood is usually an indication of some infections in our body. Give reason.

24. Draw a V – I graph for a conductor at two different temperatures. What conclusion do you draw from your graph for the variation of resistance of conductor with temperature? [2]

25. What is the focal length of a concave mirror if the radius of curvature is 24 cm? What is the nature of the image formed by a concave mirror when an object at infinity from it?[2]

OR

A concave mirror produces two times magnified real image of an object placed at 20 cm in front of it. What is the position of the image?

26. What will happen if all the carnivores are removed from the Earth? [2]

SECTION - C

Question No. 27 to 33 are short answer questions.

27. A gas is produced when conc. H_2SO_4 is added to solid sodium chloride taken in a test tube. The gas from the delivery tube is passed over dry blue litmus paper and then over moist blue litmus paper. What would you observe? Explain the reason with the help of a chemical equation. [3]

28. A sodium compound 'X', which is also used as an antacid when treated with hydrochloric acid gives off an acidic gas 'Y'. 'Y' on passing through limewater turns it milky. [3]

a) Identify 'X' and 'Y'.

b) Write balanced chemical equations for the two reactions involved.

OR

Rita reacts ethanol with ethanoic acid in the presence of conc. H_2SO_4, a fruity smell is produced. Answer the following: [3]

(a) State the class of compounds to which the fruity smelling compounds belong. Write the chemical equation for the reaction and write the chemical name of the product formed.

(b) State the role of conc. H_2SO_4 in this reaction.

29. Pertaining to the endocrine system, what will you interpret if: [3]

(a) You observe swollen neck in people living in the hills.

(b) Over secretion of growth hormone takes place during childhood.

(c) Facial hair develops in a boy aged 13.

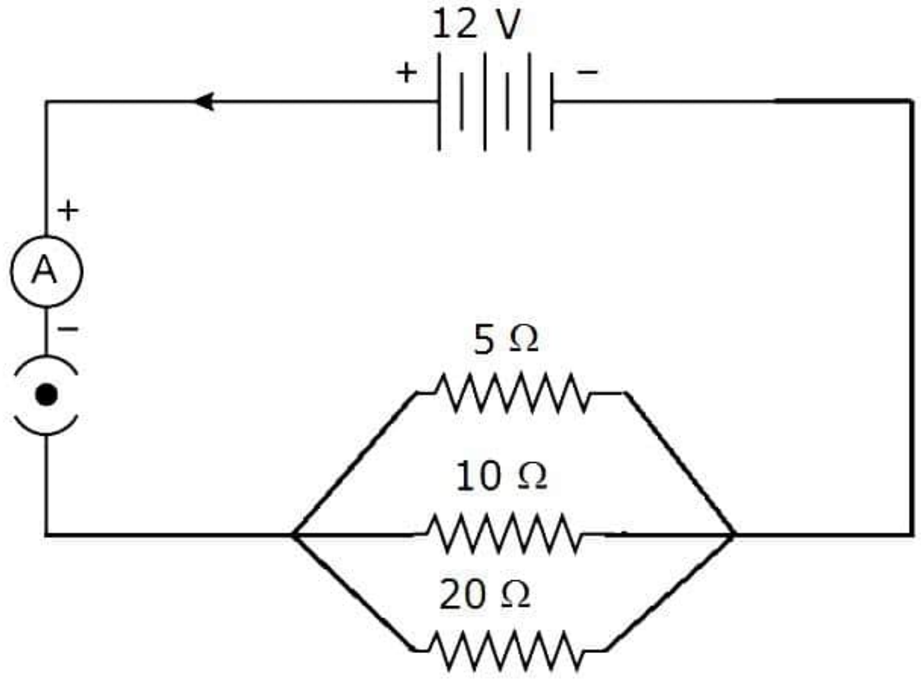
30. [3]

(a) In a cross between a pure white flowered plant and pure pink flowered plant, the F_1 generation was found to be pink. On this basis, which are the dominant and recessive traits?

(b) What is the ratio of the plants in F_2 generation?

(c) Mendel said that the characteristics (traits) of organisms are carried from one generation to another by internal factors which occur in pairs. What is the modern name for these factors?

31. In the circuit given below, three resistors of 5Ω, 10 Ω and 20Ω, respectively, are connected across a battery of 12 V. [3]



Calculate:

a) Current through each resistor

b) Total current in the circuit

c) Total resistance of the circuit

32. The image of an object placed at 60 cm in front of a lens is obtained on a screen at a distance of 120 cm from it. Find the focal length of the lens. What would be the height of the image if the object is 5 cm high? [3]

33. A convex mirror used on a bus has a focal length of 200 cm. If a scooter is located at 400 cm from this mirror, find the position, nature and magnification of the image formed in the mirror. [3]

SECTION - D

Question No. 34 to 36 are long answer questions.

34. [5]

(a) Nayana added 5% $KMnO_4$ solution drop by drop to warm ethanol taken in a test tube. What would have happened in the test tube? State the role of alkaline $KMnO_4$ solution in this reaction. What would the products if instead of ethanol if immediate higher homologue of ethanol is used. Write the chemical equation for the same.

OR

(a) Teacher gave Pihu strips of Mg, Zn, Fe, and Cu metals in different watch glasses. She put each of them in dil. HCl contained in different test tubes. Identify which of them:

i. Will not displace H_2 from dil. HCl.

ii. Forms a pale green substance.

iii. Will be displaced from its salt solution by all other metals.

OR

Consider the following organic compounds. [5]

A. $H_3C-\overset{H_2}{C}-OH$

B. $H_3C-\overset{H_2}{C}-\overset{H_2}{C}-OH$

(a) Name the functional group present in these compounds.

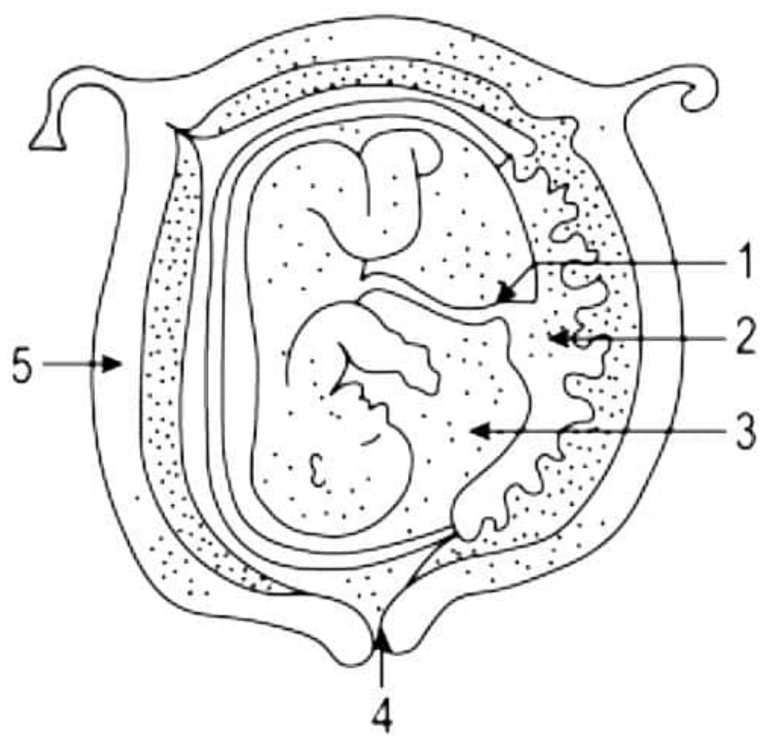
(b) Write the general formula for the compounds of this functional group.

(c) State the relationship between these compounds and draw the structure of any other compound having similar functional group.

(d) What is the action of conc. H_2SO_4 on compound A. Write the chemical reaction for same.

(e) Write two uses of compound A.

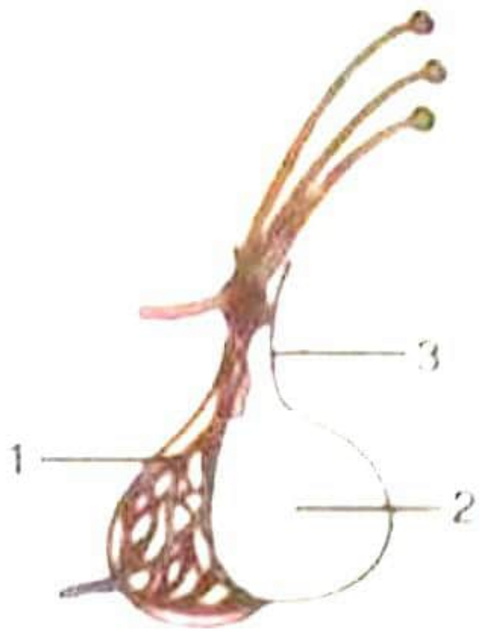
35. The diagram given below is that of a developing human foetus in the womb. Study the same and answer the questions that follow: [5]



(a) Name parts 1–5 indicated by the guidelines.
(b) How many days does the foetus normally take to fully develop?
(c) Mention two functions of the part labelled '2' other than its endocrine function.
(d) Name the hormone (*any one*) produced by the part labelled '2'.

OR

The diagram given below shows an endocrine gland in the human body. Study the diagram and answer the following questions:



(a) Identify the gland. Write its specific location in the human body.
(b) Label the guidelines 1, 2 and 3 shown in the figure.
(c) Name any two secretions from part 1 and two from part 2.
(d) The deficiency of which hormone causes diabetes insipidus? How is this condition different from diabetes mellitus with respect to the abnormal substances present in the urine.

36. (a) What is an electric circuit?
(b)Calculate the number of electrons that flow per second to constitute a current of one ampere. Charge on an electron is 1.6×10^{-19}C.
(c) Draw an electric circuit for studying Ohm's law. Label the circuit component used to measure electric current and potential difference. [5]

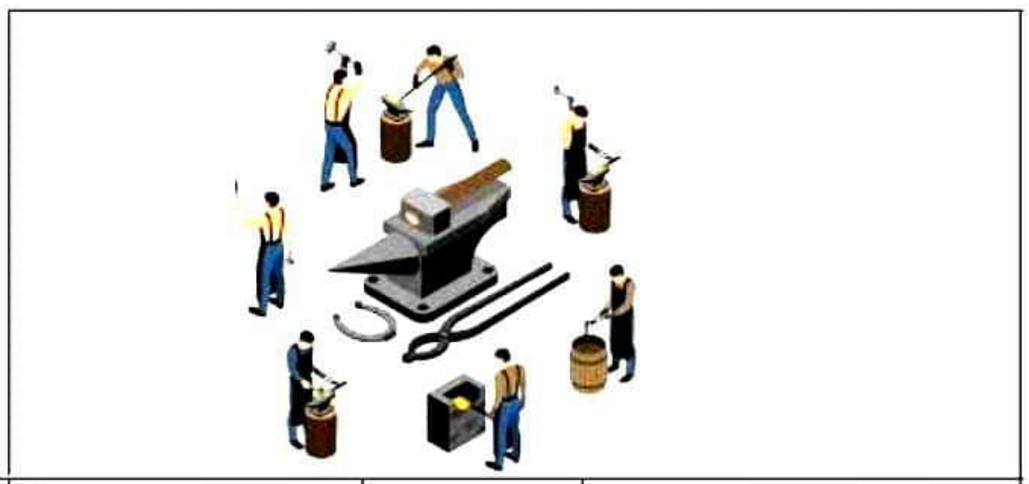
OR

A heater connected to a 230V power source draws 5.5 A current. Calculate
(i) Electric power of the heater
(ii) Resistance of the heater
(iii) Cost of operating this heater for 20 hours if commercial electricity unit cost is Rs. 4

SECTION - E

Question No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. Mohan, studying in class 10, visited a blacksmith workshop on Diwali vacation with his father. He saw a variety of articles made of metals, such as wires, long sheets, and different kitchen utensils.



His father asked him different questions to test his knowledge regarding metal properties, and Mohan enthusiastically answered all of them. Can you answer the questions below? [4]

(a) Name the property of a substance that allows it to be drawn into thin sheets along with one daily use of it. Which of the following substances can show/not show similar properties?

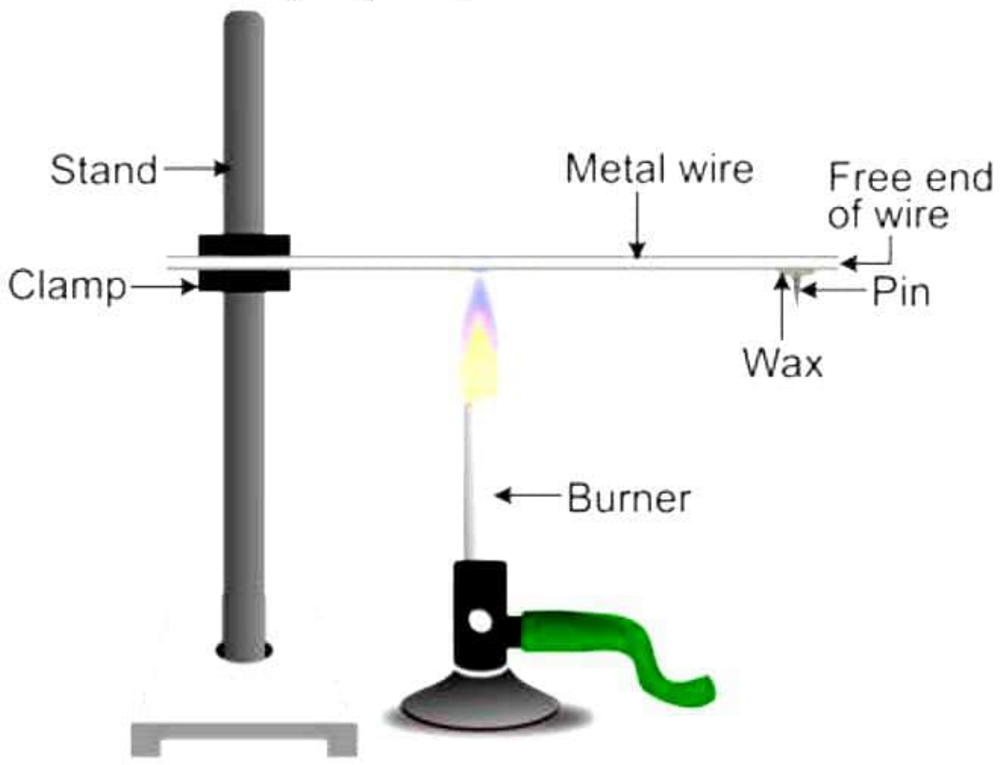
Brass, Sulphur, Sodium, Aluminium, Iron, Potassium, Phosphorous, Bronze

(b) Name the property of a substance that allows it to be drawn into long wires along with one daily use of it. Which of the following substances can show similar properties?

Iodine, Sodium, Platinum, Charcoal, Copper, Silver, Potassium, Zinc

OR

(b) What happens to wax shown in the experimental setup shown in the image below? Which property of the metal is explained in this experiment? Give two daily uses of this metallic property.



38. In human beings, blue eye colour is recessive to brown eye colour. A brown-eyed man has a blue-eyed mother. Make a cross and answer. [4]

(a) What is the genotype of the man and his mother?

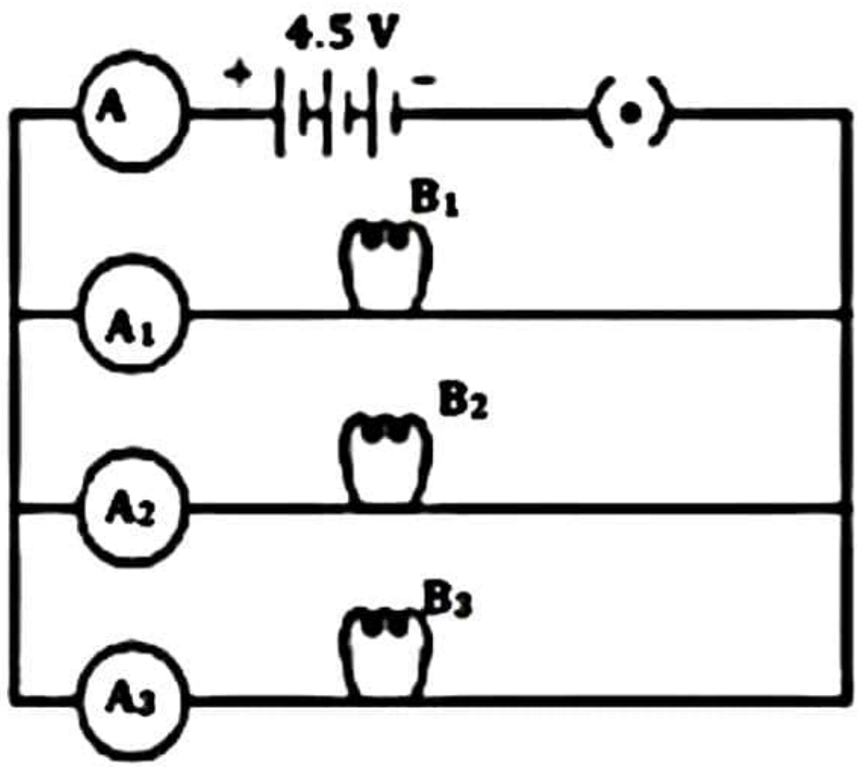
(b) What are the possible genotypes of his father?

(c) If the man marries a blue-eyed woman, what are the possible genotypes of their offspring?

OR

(c) Instead of the above cross, if there was a cross between tall and dwarf pea plants resulting in 400 individuals in F_2 generation, how many plants would have been dwarf? Give reason for your answer.

39.



Study the above circuit diagram in which the three identical bulbs B_1, B_2 and B_3 are connected in parallel with a battery of 4.5 V.

a) If bulb B3 gets fused, then the bulbs B_1 and B_2 will
   a) Glow with same brightness
   b) Will stop working
   c) B_1 will glow and B_2 will not glow
   d) B_2 will glow and B_1 will not glow

b) If the wattage of each bulb is 1.5 W and when all the bulbs glow simultaneously then the Ammeter (A) will show readings of
   a) 1 A
   b) 2 A
   c) 3 A
   d) 4 A

c) What is the total resistance of the given circuit?

OR

d) How many resistors of 88 W can be connected in parallel to carry 10 A current on a 220 V line?

Solution

SECTION – A

1. Correct option –d: A and B
Calcium oxide reacts vigorously with water to produce slaked lime.
$CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(aq)}$ is a combination reaction and is an exothermic reaction.

2. Correct option – c: Turns methyl orange to red
Tamarind contains tartaric acid, which changes the colour of methyl orange to red.

3. Correct option – a: Addition reaction
Unsaturated hydrocarbons add hydrogen in the presence of catalysts such as palladium or nickel to give saturated hydrocarbons. This reaction is called an addition reaction.

4. Correct option –a: 2
The chemical formula of gypsum or hydrated calcium sulphate is $CaSO_4.2H_2O$.

5. Correct option – a: Vinegar
Vinegar is nothing but diluted acetic acid or ethanoic acid.

6. Correct option – b: Long hydrocarbon chain – Hydrophobic, Short ionic part – Hydrophilic
The soap molecules are sodium or potassium salts of long-chain carboxylic acids. A soap molecule has a tadpole-shaped structure. At one end (long non-polar end) of the soap molecule is a hydrocarbon chain, which is insoluble in water but soluble in oil. At the other end (short polar end) of the soap molecule, there is a carboxylate ion which is hydrophilic, i.e., water-soluble but insoluble in oil.

7. Correct answer – a:

Metal	$Al_2(SO_4)_3$	$CuSO_4$	$FeSO_4$	$ZnSO_4$
(a) Al	X	√	√	√

Cu, Fe, and Zn are all placed below Al in the reactivity series; hence, these are possible reactions.
Aluminium can't react with aluminium sulphate; hence, it is an impossible reaction.

8. Correct option d: X: Pulmonary artery - Carries deoxygenated blood from the heart to the lungs, Y: Aorta – Carries oxygenated blood from the heart to other parts of the body.
Aorta is a large artery which carries oxygenated blood from the heart to other parts of the body. The primary function of the pulmonary artery is to carry deoxygenated blood from the heart to the lungs for purification.

9. Correct option b. Mucus : Maintains alkaline environment
The role of the mucus present in the gastric juice is to protect the inner lining of the stomach from the action of acids.

10. Correct option – a : Inflated green pods, GgIi
Inflated pods are dominant over constricted pods and green colour is dominant over yellow colour of the pods. Hence, the F_1 generation will express the dominant trait only, i.e., inflated, and green pods with genotype (GgIi).

GGII gii
GI gi
GgIi

11. Correct option – b : Carries sperms from the epididymis to the urethra
1 - Scrotum, 2 - Vas deferens, 3 - Epididymis
1 (Scrotum): Provides a temperature lower than the normal body temperature which is required for the production and survival of sperms.
2 (Vas deferens): Carries sperms from the epididymis to the urethra.
3 (Epididymis): Assists in the storage and maturation of sperms.

12. Correct option – c: Cretinism
The gland shown in the picture is thyroid gland which produces the hormone thyroxine. Deficiency of thyroxine in children causes cretinism which causes retarded physical and mental development.

13. Correct option – b: Beyond the centre of curvature
If the man is standing in front of a concave mirror between the centre of curvature and the focus, then the image formed is beyond the centre of curvature.

14. Correct option – d: All the statements
All the given statements are true in terms of dispersion.

15. Correct option – c) 10000 J

As per 10% law of energy transfer in an ecosystem, only 10% of energy is transferred from one trophic level to another. Hence, in the given food chain, if 100 J of energy is available to the lion, the plants or producers will have 10,000 J of energy available to them.

Plants (10,000 J) → Deer (1000 J) → Lion (100 J)

16. Correct option – c) Energy is unidirectional and matter is repeatedly circulating.

The flow of energy in the ecosystem is unidirectional. The energy enters the plants (from the Sun) through photosynthesis. This energy that is passed on to the successive trophic levels in a food chain is only 10% while rest of the energy gets lost as heat during transfer and life processes. The cycling of matter in the ecosystem occurs through a series of food chains, food webs, and nutrient cycles. The matter is transferred from one organism to another as all of them are interconnected with each other.

17. Both A and R are true, and R is the correct explanation of A

A diamond crystal is a giant molecule of carbon atoms. Each carbon atom in the diamond crystal is linked to four other carbon atoms by strong covalent bonds. The four surrounding atoms are at the four vertices of a regular tetrahedron. This rigid structure of diamond makes it a very hard substance. So, both assertion and reason are true, and reason is the correct explanation of assertion.

18. A is false but R is true.

The head of the sperm consists of an acrosome which contains enzymes that help the sperm to penetrate the egg and assist in fertilisation. Mitochondria are present in the middle portion of the sperm. So, the assertion is false, but the reason is true.

19. Both A and R are true, but R is not the correct explanation of A.

The food chain is the sequence of living organisms in a community where one organism consumes another organism to transfer food energy. The different organisms present at a certain trophic level in a food chain may intake certain harmful chemicals which pass on to different trophic levels and reach us. Thus, food chains are responsible for the entry of harmful chemicals into our bodies. So, the assertion is true.

The length and complexity of food chains vary greatly. Some food chains which involve 2-3 levels are simpler and smaller while some with 4-5 trophic levels are bigger and much more complex. So, the reason is also true.

Although, both assertion and reason are true, the reason statement does not explain the assertion statement.

20. A is true, but R is false.

In a circuit, positive terminal is at highest potential and current flows from positive terminal (highest potential level) to negative terminal (lowest potential level) in the circuit.

SECTION - B

21. When the surface of a metal is exposed to air, moisture or any other substance around it, the metal is said to corrode, and the phenomenon is known as corrosion.
(a) Silver sulphide
(b) Basic copper carbonate (mixture of copper carbonate and copper hydroxide).

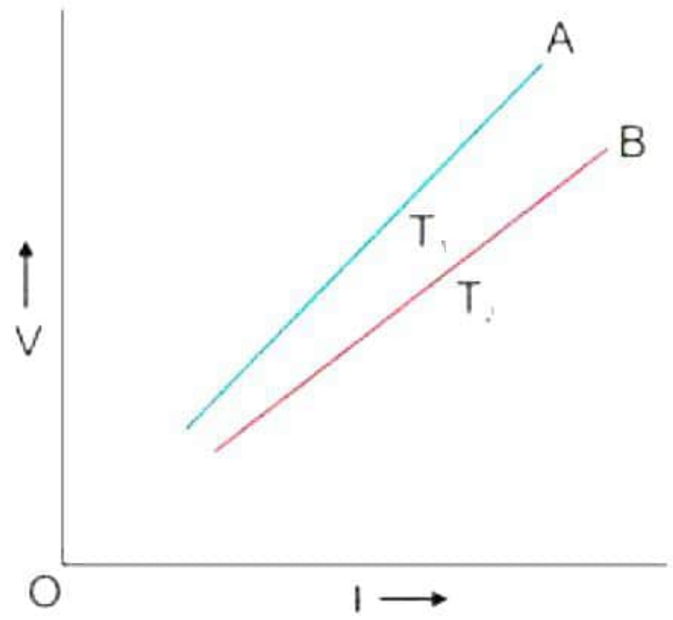
22. Multicellular organisms cannot reproduce by simpler methods such as cell division because they are not a random collection of cells. In multicellular organisms, specialised cells are organised as tissues and tissues are organised into organs, each of which occupy specific positions in the body. Therefore, cell-by-cell division in multicellular organisms would be impractical. As a result, they are required to use more complex ways of reproduction. Moreover, simpler multicellular organisms possess special type of tissues which have the potential to grow into a new organism, but complex multicellular organisms have no such specialised cells.

23.
(a) The structure represented in the diagram is a nephron, which is the structural and functional unit of kidney.
(b) The liquid entering part '1' and '2' are called glomerular filtrate and urine respectively.

OR

(a) <u>Role of WBCs in our body:</u> White Blood Cells (WBCs) are the defense system of our body. They produce antibodies and help in fighting against the germs that enter our body.
(b) By eradicating the germs, the WBCs in our blood defend the body against infections. They engulf and destroy the disease-causing germs. Their population grows if there is an infection. Therefore, a rise in the number of WBCs suggests infection.

24.



In the given graph T1 > T2.

The straight-line A is steeper than the line B which leads us to conclude that the resistance of conductor is more at high temperature T1 than at low temperature T2. Thus, we can say that resistance of a conductor increases with the increase in temperature.

25. R = –24 cm (Radius of curvature of a concave mirror)

We know, f = R/2 = – 24/2 = – 12 cm.

The image formed by a concave mirror when an object is placed at infinity is real, inverted and diminished.

OR

Magnification (m) = –2 (image is real)

Object distance (u) = –10 cm (object is to the left of the mirror)

To find: Image distance (v)

Magnification of spherical mirrors is given as

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

$$-2 = \frac{-v}{-10}$$

v = - 20 cm

Thus, the image is located at a distance of 20 cm in front of the mirror.

26. If all the carnivores are removed from the Earth, the population of herbivores would increase. Large population of herbivores will overgraze. As a result, all plants will disappear from the Earth's surface and ultimately the Earth will turn into a desert. The biosphere will get disturbed which will lead to the end of life on the Earth.

SECTION - C

27. HCl gas is produced.

$2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$

The gas, when passed through dry litmus paper, will show no change in colour because it cannot show acidic properties as H^+ is not present.

The gas, when passed through moist litmus paper will show colour change to red.

It shows acidic properties because H^+ ions are produced when HCl dissolves in water.

28.

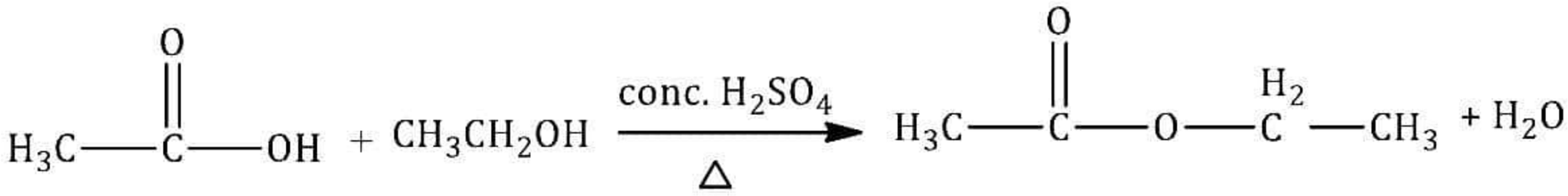
(a) 'X' is $NaHCO_3$ and 'Y' is CO_2.

(b) (i) $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$

(ii) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

OR

(a) Esters are the fruity smelling compounds.



(b) Esterification takes place in the presence of catalyst concentrated H_2SO_4. It acts as a dehydrating agent, i.e., helps in the removal of water formed in the reaction between alcohol and carboxylic acid.

29.

(a) Appearance of swollen neck in people living in the hills is due to lack of iodine in their diet. This happens because at higher altitudes, the soil and water are deficient in iodine. As a result, the crops grown in these areas also lack iodine. Low availability of iodine results in reduced functioning of the thyroid gland which causes goitre.

(b) Over secretion of growth hormone during childhood causes gigantism in which there is an abnormal growth in body parts and bones due to increased secretion of growth hormone from the pituitary gland.

(c) Facial hair growth in a boy aged 13 indicates that the boy has reached puberty. The timely secretion of sex hormone, testosterone brings about the growth of facial hair in boys.

30.

(a) In a Mendel's monohybrid cross, according to the law of dominance, only the dominant traits are expressed in the F_1 generation. Since, the F_1 generation was found to be pink, it can be concluded that the pink colour of flowers is the dominant trait whereas white colour is the recessive trait.

(b) Parents – Pink (RR) × White (rr)

Gametes – R, R and r, r

F_1 generation – Rr

Selfing – Rr × Rr

	R	r
R	RR (pink)	Rr (pink)
r	Rr (pink)	Rr (white)

Phenotypic ratio – Pink : White – 3 : 1

Genotypic ratio – RR : Rr : rr – 1 : 2 : 1

(c) Genes are the hereditary units which carry characteristics that are transferred from the parents to the next generation.

31.

(a) As the resistors are connected in parallel, the voltage across each resistor is the same. Hence, current through each resistor is

$$I_5 = \frac{V}{5} = \frac{12}{5} = 2.4 \text{ A}$$

$$I_{10} = \frac{V}{10} = \frac{12}{10} = 1.2 \text{ A}$$

$$I_{20} = \frac{V}{20} = \frac{12}{20} = 0.6 \text{ A}$$

(b) Total current in the circuit is

$$I = I_5 + I_{10} + I_{20}$$

$$\therefore I = 2.4 + 1.2 + 0.6$$

$$\therefore I = 4.2 \text{ A}$$

(c) Total resistance in the circuit is

$$V = IR_{eq}$$

$$\therefore R_{eq} = \frac{V}{I} = \frac{12}{4.2}$$

$$\therefore R_{eq} = 2.85\ \Omega$$

32. Object distance, u = –60 cm

Image distance, v = 120 cm

From the lens formula,

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

$$\therefore \frac{1}{f} = \frac{1}{120} - \frac{1}{-60} = \frac{1}{120} + \frac{1}{60}$$

$$\therefore \frac{1}{f} = \frac{3}{120} = \frac{1}{40}$$

$$\therefore f = 40 \text{ cm}$$

Height of the object, h = 5 cm

From the magnification formula,

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

$$\therefore h' = \frac{v}{u}h = \frac{120}{-60} \times 5 = -10 \text{ cm}$$

33. Focal length of a convex mirror, f = 200 cm

Distance of a scooter from the mirror, u = –400 cm

From the mirror formula,

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

$$\therefore \frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{200} - \frac{1}{-400} = \frac{1}{200} + \frac{1}{400}$$

$$\therefore \frac{1}{v} = \frac{3}{400}$$

$$\therefore v = 133.33 \text{ cm}$$

Hence, the image is located 133.33 cm from the mirror. As the image distance is positive, it is a virtual image.

Magnification produced by the mirror is

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

$$\therefore m = \frac{-133.33}{-400} = +0.33 \text{ cm}$$

SECTION - D

34.

(a) When 5% alkaline $KMnO_4$ solution is added drop by drop to warm ethanol then it gets oxidised to ethanoic acid.

$$CH_3CH_2OH \xrightarrow{\text{alkaline } KMnO_4} CH_3COOH$$

In this chemical reaction, alkaline $KMNO_4$ acts as an oxidizing agent, i.e., the substance which is capable of adding oxygen to others. Thus, alkaline $KMnO_4$ provides oxygen to ethanol to form ethanoic acid.

The immediate higher homologue of ethanol is propanol, and the product would be propanoic acid. The chemical equation is as follows:

$$CH_3CH_2CH_2OH \xrightarrow{\text{alkaline } KMnO_4} CH_3CH_2COOH$$

Propanol Propanoic acid

(b)

(i) Cu since copper is less reactive than hydrogen.

(ii) Fe ($Fe + \text{dil. } 2HCl \rightarrow FeCl_2 + H_2\uparrow$)

(iii) Cu since copper is less reactive than all the other mentioned metals.

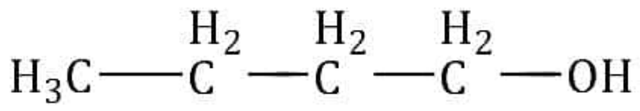
OR

(a) The name of functional group present in this compound is alcohol (-OH).

(b) The general formula for the compounds of this functional group is: $C_nH_{2n+1}OH$

(c) The molecular formula of compound A is C_2H_5OH and the molecular formula of compound B is C_3H_7OH. Hence, they belong to the same homologous series of alcohol with general formula $C_nH_{2n+1}OH$. Compound A and compound B are consecutive members of alcohol homologous series.

The next member of this series is Butanol, and the structure is as follows:



(d) Ethanol, on heating with excess of conc. H_2SO_4 at 170° C gets dehydrated to form ethene.

The chemical reaction of compound A with conc. H_2SO_4 is as follows:

$$CH_3CH_2OH \xrightarrow{\text{conc.}H_2SO_4, 170^\circ C} CH_2=CH_2 + H_2O$$

(e) Two uses of ethanol are:

A. It is good solvent for gums and resins.

B. Used in the manufacture of chemicals and synthetic products such as dyes, perfumes, antiseptics, preservatives, etc.

35.

(a) 1 - Umbilical cord
2 - Placenta
3 - Amniotic fluid
4 - Mouth of uterus
5 - Wall of uterus

(b) 280 days

(c) <u>Function of part 2 (placenta):</u>

- Excretes nitrogenous wastes and carbon dioxide.
- Does not allow passage of germs from the mother to the foetus.

(d) Progesterone

OR

(a) The gland is pituitary gland. It is a small, pea-sized endocrine gland located at the base of the mid-brain below the hypothalamus.

(b) 1 - Posterior pituitary, 2 - Anterior pituitary, 3 - Hypophysial stalk

(c) Two secretions from posterior pituitary (1): Vasopressin and oxytocin
Two secretions from anterior pituitary (2): Thyroid stimulating hormone and growth hormone.

(d) Deficiency of anti-diuretic hormone (ADH) causes diabetes insipidus. In diabetes mellitus, the urine contains sugar but in diabetes insipidus, there is no sugar in urine.

36. (a) A continuous conducting path consisting of wires and other resistances (like electric bulb etc.) and a switch between the two terminals of a cell or a battery along which an electric current flows is called an electric circuit.

(b) Given:

$I = 1\ A$

$t = 1\ sec$

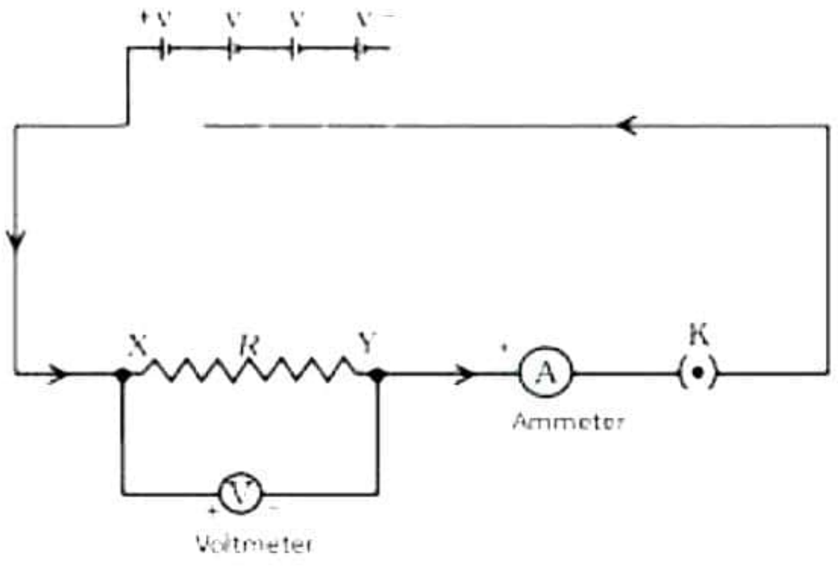
$Q = 1\ C$

1.6×10^{-19} C is the charge on 1 electron.

1 C is the charge on electrons = (6.25×10^{18}) electrons.

6.25×10^{18} electrons flow per second to constitute the current of one ampere.

(c)



OR

i) Power is

$$P = VI = 230 \times 5.5 = 1265\ W$$

$$= 1.265\ kW$$

ii) Resistance of the heater

$$R = \frac{V}{I} = \frac{230}{5.5} = 41.82\ \Omega$$

iii) Running cost or cost of consumption for 20 hours

$$Cost = 1.265 \times 20 \times 4 = Rs.101.20$$

SECTION – E

37.

(a) The property of the substance which allows it to get drawn into thin sheets is termed as 'Malleability'. Many metals have this property.
From the given examples, metals like aluminium and iron can be drawn into thin sheets due to their malleable nature.
Sodium and potassium, despite being metal, are not malleable.
Sulphur and phosphorous cannot be drawn into thin sheets as non-metals are generally not malleable.
Brass (alloy of copper and zinc) and bronze (alloy of copper and tin) are malleable and can be easily drawn into thin sheets.
Use in daily life: to make coins.

(b) The property of the substance which allows it to get drawn into long wires is termed as 'Ductility'. Many metals have this property.
From the given examples, metals like copper, platinum, silver, and zinc can be drawn into long wires due to their malleable nature.
Sodium and potassium, despite being metal, are not ductile.
Iodine and charcoal (carbon) cannot be drawn into long wires as non-metals are generally not ductile.
Uses in daily life: copper wires used in electricity wires.

OR

(b) Observation of the given experimental set up is the wax melts after some time due to heated metal rod.
The property of metal explained in the given experimental set up is conductivity of heat.
Uses of this metallic property in daily life:
(i) Cooking utensils
(ii) Kettle
(iii) Boiler

38. According to the given condition, brown eye colour is dominant over blue eye colour.

Father × Mother (blue-eyed)

↓

Man (brown eyed)

(a) The mother genotype must be bb as she is recessive for blue-coloured eye. The man is brown-eyed (dominant character). It is possible that his genotype is Bb as he is procuring one of the recessive genes from his mother.

(b) As the genotype of the man is Bb, so the possible genotypes of his father are BB or Bb.

(c)

Parents	...	Brown-eyed man (heterozygous)	× Blue-eyed woman
Genes	...	Bb	× bb
Gametes	...	B, b	× b, b

	B	b
b	Bb Brown-eyed	bb Blue-eyes
b	Bb Brown-eyed	bb Blue-eyed

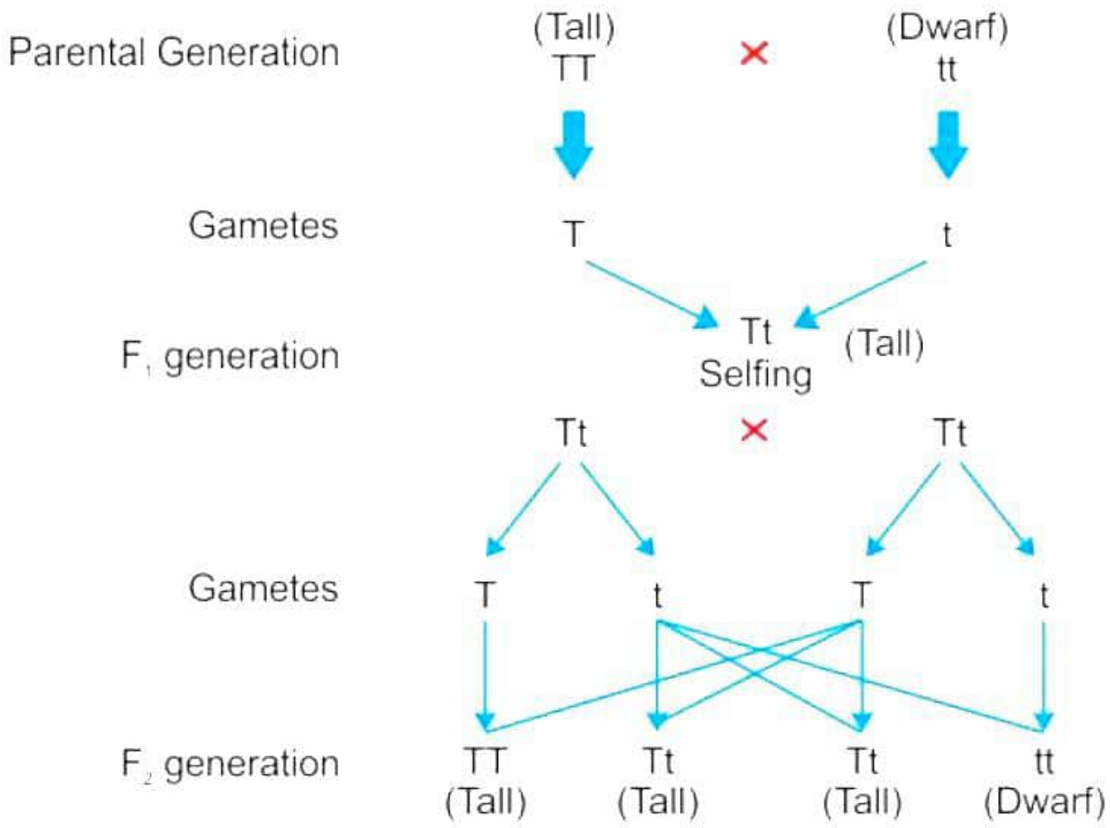
Result:

50% offspring have brown eye with genotype Bb.

50% offspring have blue eye with genotype bb.

OR

(c) The cross is depicted as under:



With respect to height of the plant, the trait for tallness is dominant over trait for dwarfness. Thus, the phenotypic ratio of tall and dwarf plants in F_2 generation would be 3 : 1. Hence, out of 400 individuals, 100 individuals would have been dwarf and 300 would have been tall.

39.

a) a) glow with same brightness

As the three bulbs are connected in parallel, even if one bulb gets fuse two other bulbs will grow with same intensity as and when the bulb B3 was still in working condition.

b) a) 1 A

When bulbs are in parallel, the wattage is added. Thus, power will be 4.5 W.

$I = P/V = 4.5\ W/ 4.5\ V = 1\ A$

c) The current in the circuit is 1 A. Thus, resistance of the combination is

$R = 4.5V/1A = 4.5$ ohms.

OR

d) Let n number of resistances be connected in parallel

Thus, resistance will be,

$1/R_p = 88/n = 220/10$

$n = 88/22 = 4$ resistors.