

# Sample Question Paper, 2021-22

(Issued by CBSE Board on 14<sup>th</sup> January 2022)

## SCIENCE (Term-II)

**SOLVED**

### General Instructions :

- All questions are compulsory.
- The question paper has **three sections** and **15 questions**.
- Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.
- Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

### Section - A

1. The table shows the electronic structures of four elements. [2]

Element	P	Q	R	S
Electronic Structure	2, 6	2, 8, 1	2, 8, 7	2, 8, 8

- Identify which element(s) will form covalent bonds with carbon.
  - “Carbon reacts with an element in the above table to form several compounds.” Give suitable reason.
2. The diagram below shows part of the periodic table. [2]

- Which elements would react together to form covalent compounds?
- Between the two elements W and Z, which will have a bigger atomic radius? Why?



3. (a) Trace the path a male gamete takes to fertilise a female gamete after being released from the penis. [2]
- (b) State the number of sets of chromosomes present in a zygote.
4. Rajesh observed a patch of greenish black powdery mass on a stale piece of bread. [2]
- Name the organism responsible for this and its specific mode of asexual reproduction.
  - Name its vegetative and reproductive parts.
5. Mustard was growing in two fields- A and B, while field A produced brown coloured seeds, field B produced yellow coloured seeds. [2]

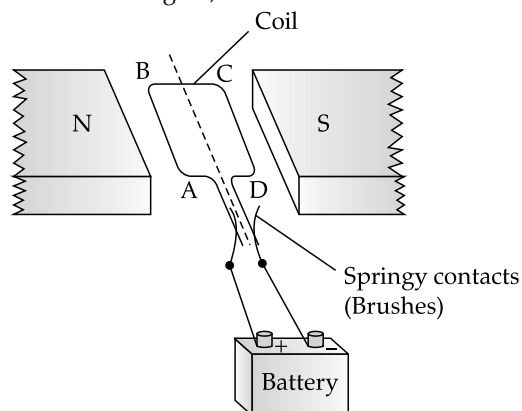
It was observed that in field A, the offsprings showed only the parental trait for consecutive generations, whereas in field B, majority of the offsprings showed a variation in the progeny.

What are the probable reasons for these?

**OR**

In an asexually reproducing species, if a trait X exists in 5% of a population and trait Y exists in 70% of the same population, which of the two traits is likely to have arisen earlier? Give reason.

6. A simple motor is made in a school laboratory. A coil of wire is mounted on an axle between the poles of a horseshoe magnet, as illustrated. [2]

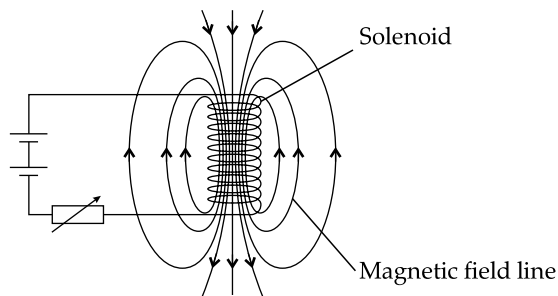


In the example above, coil ABCD is horizontal and the battery is connected as shown.

- For this position, state the direction of the force on the arm AB.
- Why does the current in the arm BC not contribute to the turning force on the coil?

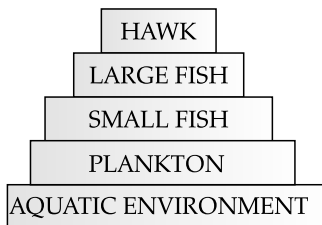
**OR**

A circuit contains a battery, a variable resistor and a solenoid. The figure below shows the magnetic field pattern produced by the current in the solenoid.



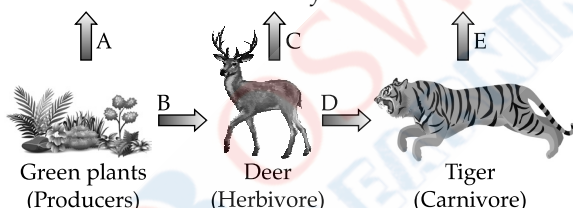
- (a) State how the magnetic field pattern indicates regions, where the magnetic field is stronger.  
 (b) What happens to the magnetic field when the current in the circuit is reversed?

7. DDT was sprayed in a lake to regulate breeding of mosquitoes. How would it affect the trophic levels in the following food chain associated with a lake? Justify your answer. [2]



OR

In the following food chain, vertical arrows indicate the energy lost to the environment and horizontal arrows indicate the energy transferred to the next trophic level. Which one of the three vertical arrows (A, C and E) and which one of the two horizontal arrows (B and D) will represent more energy transfer? Give reason for your answer.



Food chain in a forest ecosystem

## Section - B

8. Choose an element from period 3 of modern periodic table that matches the description given below in each instance. Give reason for your choice. [3]
- (a) It has a similar structure to diamond.  
 (b) It has same valency as Lithium.  
 (c) It has variable valency and is a member of the Oxygen family (group 16).
9. (a) How many isomers are possible for the compound with the molecular formula  $C_4H_8$ ? Draw electron dot structure of branched chain isomer. [3]  
 (b) How will you prove that  $C_4H_8$  and  $C_5H_{10}$  are homologous?

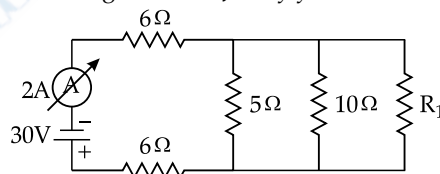
OR

A carbon compound 'A' having melting point 156K and boiling point 351K, with molecular formula  $C_2H_6O$  is soluble in water in all proportions.

- (a) Identify 'A' and draw its electron dot structure.  
 (b) Give the molecular formulae of any two homologous of 'A'.
10. Two pea plants-one with round yellow (RRYY) seeds and another with wrinkled green (rryy) seeds produce  $F_1$  progeny that have round, yellow (RrYy) seeds. [3]  
 When  $F_1$  plants are self-pollinated, which new combination of characters is expected in  $F_2$  progeny? How many seeds with these new combinations of characters will be produced when a total of 160 seeds are produced in  $F_2$  generation? Explain with reason.

11. (a) It would cost a man ₹3.50 to buy 1.0 kW h of electrical energy from the Main Electricity Board. His generator has a maximum power of 2.0 kW. The generator produces energy at this maximum power for 3 hours. Calculate how much it would cost to buy the same amount of energy from the Main Electricity Board. [1]  
 (b) A student boils water in an electric kettle for 20 minutes. Using the same mains supply, he wants to reduce the boiling time of water. To do so, should he increase or decrease the length of the heating element? Justify your answer. [2]

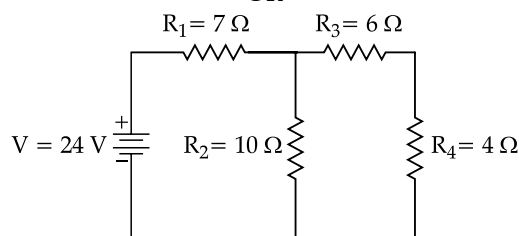
12.



[3]

In the above circuit, if the current reading in the ammeter A is 2A, what would be the value of  $R_1$ ?

OR



Calculate the total resistance of the circuit and find the total current in the circuit.

13. Gas A, found in the upper layers of the atmosphere, is a deadly poison but is essential for all living beings. The amount of this gas started declining sharply in the 1980's. [3]
- (a) Identify Gas A. How is it formed at higher levels of the atmosphere?  
 (b) Why is it essential for all living beings? State the cause for the depletion of this gas.

### Section - C

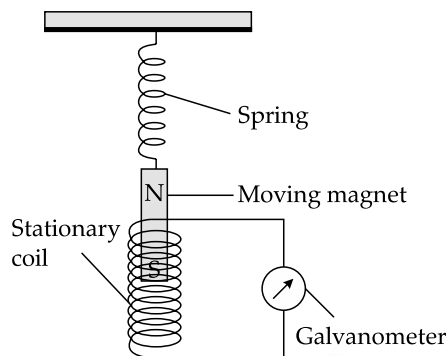
This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a), (b), (c). Parts (a) and (b) are compulsory. However, an internal choice has been provided in part (c).

14. Sahil performed an experiment to study the inheritance pattern of genes. He crossed tall pea plants (TT) with short pea plants (tt) and obtained all tall plants in F<sub>1</sub> generation. [1]
- What set of genes will be present in the F<sub>1</sub> generation? [1]
  - Give reason, why only tall plants are observed in F<sub>1</sub> progeny. [1]
  - When F<sub>1</sub> plants were self - pollinated, a total of 800 plants were produced. How many of these would be tall, medium height or short plants? Give the genotype of F<sub>2</sub> generation. [2]

OR

When F<sub>1</sub> plants were cross-pollinated with plants having tt genes, a total of 800 plants were produced. How many of these would be tall, medium, or short plants? Give the genotype of F<sub>2</sub> generation.

15. Ansari Sir was demonstrating an experiment in his class with the setup as shown in the figure below.



[4]

A magnet is attached to a spring. The magnet can go in and out of the stationary coil.

He lifted the magnet and released it to make it oscillate through the coil. Based on your understanding of the phenomenon, answer the following questions.

- What is the principle which Ansari Sir is trying to demonstrate? [1]
- What will be observed when the magnet starts oscillating through the coil. Explain the reason behind this observation. [1]
- Consider the situation where the magnet goes in and out of the coil. State two changes which could be made to increase the deflection in the galvanometer. [2]

OR

Is there any difference in the observations in the galvanometer when the magnet swings in and then out of the stationary coil? Justify your answer. [2]

□□□

## Marking Scheme Answers 2021-22 (Issued by CBSE)

### Section - A

- P and R 1/2 + 1/2
  - Carbon has a valency of four or tetravalency & catenation 1/2 + 1/2
- Y and Z 1
  - W has bigger atomic radius. 1/2

Reason:

Down the group, number of shells increases.

1/2

- Male gamete (sperm) travels in the female reproductive tract after being released. The path which it takes to fertilise the female gamete (egg) is vagina, uterus, fallopian tube where it fuses with the egg cell resulting in the formation of a zygote  
(Alternative: labelled figure of human female reproductive system indicating the passage of sperm from vagina to uterus and then to fallopian tube for fertilisation, resulting in the formation of a zygote.) 1

- Zygote has 2 sets of chromosomes. 1
- The greenish black powdery mass on a stale piece of bread is due to bread mould (Rhizopus) which reproduces by spore formation. 1/2 + 1/2
    - Hyphae or thread like structures are the vegetative part and tiny blob like structures or sporangia are the reproductive parts. 1/2 + 1/2
  - In field A, the reason for parental trait in consecutive generations of the offspring is self-pollination. 1  
In field B, variation is seen because of recombination of genes as cross-pollination is taking place. 1

OR

Trait Y, which exists in 70% (larger fraction) of the population, is likely to have arisen earlier because in asexual reproduction, identical, copies of DNA are produced and variations do not occur. 1

New traits come in the population due to sudden mutation and then are inherited. 70 % of the population with trait Y is likely to have been replicating that trait for a longer period, than 5 % of population with trait X. 1

6. (a) downwards 1  
 (b) Because BC is in the same direction as the direction of field lines. Force is minimum when the direction of current in the conductor is the same as that of the magnetic field. BC will not contribute as the force on this part of the coil will be cancelled by the force on DA. 1

OR

- (a) Relative closeness of field lines indicates the strength of magnetic field. Since, field lines are crowded around the ends of the solenoid, hence these are the regions of strongest magnetism. 1  
 (b) The direction of the field will also be reversed. 1
7. ● DDT being a non-biodegradable pesticide will enter the food chain from the first trophic level i.e., Plankton. ½  
 ● Non-biodegradable pesticides accumulate progressively at each trophic level. This phenomenon is known as biological magnification. 1  
 ● Hawk will have the highest level of pesticide. ½

OR

A will represent more energy transfer as compared to C and E. ½

B will represent more energy transfer as compared to D. ½

When green plants are eaten by primary consumers, a great amount of energy is lost as heat in to the environment, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. An average of 10% of the food eaten is made available for the next level of consumers. This loss of energy takes place at every trophic level. 1

(Alternatively accept- In accordance with 10% law of transfer of energy in a food chain, only 10% of energy available at one trophic level is transferred to the next trophic level.)

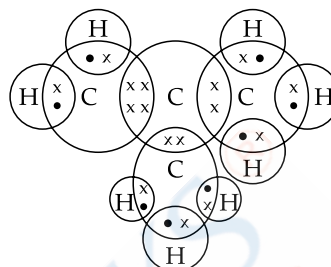
### Section - B

8. (a) Silicon  
 Reason: Tetrahedral structure  
 OR  
 Tetravalency or four valency and catenation  
 OR  
 Covalent bonding like carbon ½+½

- (b) Sodium  
 Reason: It has 1 valence electron like Lithium ½+½

- (c) Sulphur  
 Reason: It forms oxides  $\text{SO}_2$  and  $\text{SO}_3$  ½+½

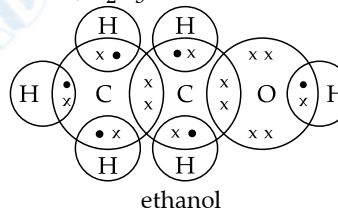
9. (a) Five 1½



- (b)  $\text{C}_4\text{H}_8$  and  $\text{C}_5\text{H}_{10}$  are homologous ½  
 as they differ in  
 ● " $-\text{CH}_2-$ "  
 ● differ in 14u molecular mass  
 ● Same functional group  
 ● Same general formula ½+½  
 (Any two reasons)

OR

- (a) Ethanol;  $\text{C}_2\text{H}_5\text{OH}$  1+1



ethanol

- (b)  $\text{CH}_3\text{OH}$  and  $\text{C}_3\text{H}_7\text{OH}$  are homologous of ethanol. 1

OR

- $\text{CH}_4\text{O}$  and  $\text{C}_3\text{H}_8\text{O}$  1

10. Round green: 30 ½+½  
 Wrinkled yellow: 30 ½+½

New combinations are produced because of the independent inheritance of seed shape and seed colour trait. 1

11. (a)  $E = P \times T$   
 So,  $E = 3 \times 2 = 6 \text{ kWh}$  1

Cost of buying electricity from the main electricity board =  $6 \times 3.50 = ₹21.0$

- (b) To reduce the boiling time using the same mains supply, the rate of heat production should be large. We know that  $P = V^2/R$ . Since  $V$  is constant,  $R$  should be decreased. Since  $R$  is directly proportional to  $L$  so, length should be decreased. 2

12. 5 ohm, 10 ohm and  $R_1$  are in parallel connection

$$1/R_p = 1/5 + 1/10 + 1/R_1$$

$$1/R_p = (2+1)/10 + 1/R_1 = 3/10 + 1/R_1$$

$$1/R_p = (3R_1 + 10)/10R_1$$

$$R_p = 10R_1 / (3R_1 + 10)$$

Now, 6 ohm, 6 ohm and  $R_p$  are in series

Thus,

$$R_{eq} = 12 + 10 R_1 / (3R_1 + 10) \dots(i) \quad 1$$

$$V = I R_{eq}$$

From the circuit

$$R_{eq} = 30/2 = 15 \Omega \dots(ii) \quad 1$$

Equating (i) and (ii)

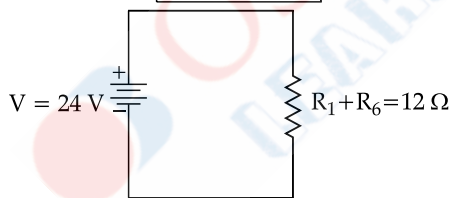
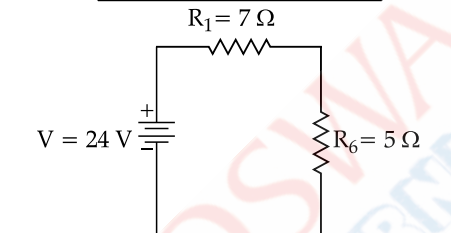
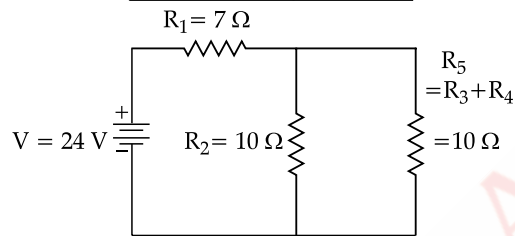
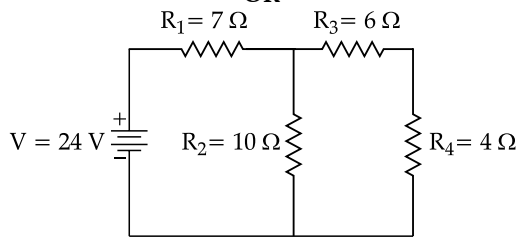
$$12 + 10 R_1 / (3R_1 + 10) = 15$$

$$10R_1 / (3R_1 + 10) = 3$$

$$10R_1 = (9R_1 + 30)$$

$$\text{Thus, } R_1 = 30 \text{ ohm.} \quad 1$$

OR



$R_3$  and  $R_4$  are in series, hence the equivalent resistance of those two =  $R_5 = R_3 + R_4 = 10 \text{ ohm.}$   $\frac{1}{2}$

$R_5$  and  $R_2$  are in parallel, Let  $R_6$  be the equivalent resistance for them. Hence,  $R_6 = (R_5 R_2) / (R_5 + R_2) = 100/20 = 5 \text{ ohm}$   $\frac{1}{2}$

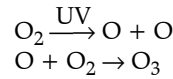
Now  $R_1$  and  $R_6$  are in series and hence the final equivalent resistance of the entire circuit is  $R = R_1 + R_6 = 12 \text{ ohm.}$   $1$

By Ohm's Law, we know that  $V = IR$ , hence  $I = V/R$ .

Hence the current in the circuit is  $24/12 \text{ A} = 2 \text{ A}$   $1$

13. (a) Gas A is Ozone.  $\frac{1}{2}$

Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen ( $O_2$ ) molecule. The higher energy UV radiations split apart some molecular oxygen ( $O_2$ ) into free oxygen (O) atoms. These atoms then combine with molecular oxygen to form ozone.  $1$



(b) Ozone shields the surface of the earth and protects living organisms from ultraviolet (UV) radiations released by the sun.  $\frac{1}{2}$

Chlorofluorocarbons (CFC's) which are used as refrigerants in fire extinguishers lead to depletion of ozone layer.  $\frac{1}{2} + \frac{1}{2}$

### Section - C

14. (a) Tt  $1$

(b) Both the recessive and dominant trait are passed on in  $F_1$  progeny. Out of the two trait only one of them is able to express itself in the progeny, which is called the dominant (T), while the other one is called the recessive (t). Here, the 'tall' trait is the dominant one.  $1$

(c) Out of 800 plants, 600 plants will be tall and 200 plants will be small.  $1:2:1$  (TT:Tt:tt)  $1+1$

OR

In the cross between Tt X tt, 400 Tall (Tt) and 400 short (tt) plants will be produced.  $1$

$1:1$  (Tt:tt)  $1$

15. (a) Sir is trying to demonstrate the principle of Electromagnetic induction.  $1$

(b) There will be fluctuating induced current in the coil due to relative motion between the magnet and the coil. Accordingly the galvanometer needle will fluctuate on either side of 0 mark. Changing the magnetic field around the coil generates induced current.  $1$

(c) Using a stronger magnet, or using a coil with more number of turns.  $2$

OR

When the magnet moves into the coil, the galvanometer shows a momentary deflection towards one side, say left.  $\frac{1}{2}$

When the magnet moves out of the coil, the galvanometer shows a momentary deflection now towards right.  $\frac{1}{2}$

This is due to changing magnetic field /flux associated with the coil as the magnet moves in and out.

Alternatively, the flux increases when the magnet goes in and it decreases when the magnet goes out.  $1$





# Solved Paper, 2021-22

## SCIENCE

### Term-I, Set-4

Series : JSK/2

Question Paper

Code No. 031/2/4

Time allowed : 90 Minutes

Max. Marks : 40

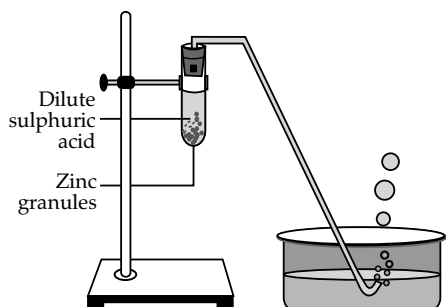
#### General Instructions :

- This question paper contains 60 questions out of which 50 questions are to be attempted. All questions carry equal marks.
- The question paper consists three sections – Section A, B and C.
- Section–A consists of 24 questions. Attempt any 20 questions from Q. No. 1 to 24.
- Section–B also consists of 24 questions. Attempt any 20 questions from Q. No. 25 to 48.
- Section–C consists of three Case Studies containing 12 questions and 4 questions in each case. Attempt any 10 from Q. No. 49 to 60.
- There is only one correct option for every Multiple Choice Question (MCQ). Marks will not be awarded for answering more than one option.
- There is no negative marking.

#### SECTION-A

Section-A consists of 24 questions (Q. No. 1 to 24). Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.

- A student took sodium sulphate solution in a test tube and added barium chloride solution to it. He observed that an insoluble substance has formed. The colour and molecular formula of the insoluble substance is:  
(a) Grey,  $\text{Ba}_2\text{SO}_4$  (b) Yellow,  $\text{Ba}(\text{SO}_4)_2$   
(c) White,  $\text{BaSO}_4$  (d) Pink,  $\text{BaSO}_4$
- Which of the following oxide(s) is/are soluble in water to form alkalis?  
(i)  $\text{Na}_2\text{O}$  (ii)  $\text{SO}_2$   
(iii)  $\text{K}_2\text{O}$  (iv)  $\text{NO}_2$   
(a) (i) and (iii) (b) (i) only  
(c) (ii) and (iv) (d) (iii) only
- Study the diagram given below and identify the gas formed in the reaction.

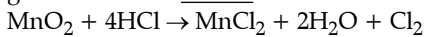


- Carbon dioxide which extinguishes the burning candle.
  - Oxygen due to which the candle burns more brightly.
  - Sulphur dioxide which produces a suffocating smell.
  - Hydrogen which while burning produces a popping sound.
- Sodium reacts with water to form sodium hydroxide and hydrogen gas. The balanced equation which represents the above reaction is;  
(a)  $\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + 2\text{H}_2(\text{g})$   
(b)  $2\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2(\text{g})$   
(c)  $2\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{NaOH}(\text{aq}) + 2\text{H}_2(\text{g})$   
(d)  $2\text{Na}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + 2\text{H}_2(\text{g})$
  - Which of the options in the given table are correct?

Option	Natural Source	Acid Present
(i)	Orange	Oxalic acid
(ii)	Sour milk	Lactic acid
(iii)	Ant sting	Methanoic acid
(iv)	Tamarind	Acetic acid

- (i) and (ii) (b) (i) and (iv)
  - (ii) and (iii) (d) (iii) and (iv)
- $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) + 6\text{O}_2(\text{aq}) \rightarrow 6\text{CO}_2(\text{aq}) + 6\text{H}_2\text{O}(\text{l})$   
The above reaction is a/an  
(a) displacement reaction  
(b) endothermic reaction  
(c) exothermic reaction  
(d) neutralisation reaction

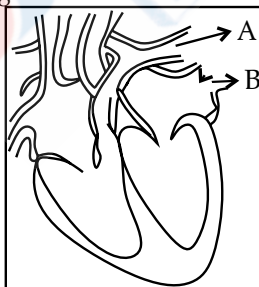
7. Which of the following statements about the reaction given below are correct?



- (i) HCl is oxidized to  $\text{Cl}_2$   
 (ii)  $\text{MnO}_2$  is reduced to  $\text{MnCl}_2$   
 (iii)  $\text{MnCl}_2$  acts as an oxidizing agent  
 (iv) HCl acts as an oxidizing agent
- (a) (ii), (iii) and (iv)      (b) (i), (ii) and (iii)  
 (c) (i) and (ii) only      (d) (iii) and (iv) only
8. Select from the following the statement which is true for bases.
- (a) Bases are bitter and turn blue litmus red.  
 (b) Bases have a pH less than 7.  
 (c) Bases are sour and change red litmus to blue.  
 (d) Bases turn pink when a drop of phenolphthalein is added to them.
9. Study the following table and choose the correct option:

	Salt	Parent Acid	Parent Base	Nature of Salt
(a)	Sodium Chloride	HCl	NaOH	Basic
(b)	Sodium Carbonate	$\text{H}_2\text{CO}_3$	NaOH	Neutral
(c)	Sodium Sulphate	$\text{H}_2\text{SO}_4$	NaOH	Acidic
(d)	Sodium Acetate	$\text{CH}_3\text{COOH}$	NaOH	Basic

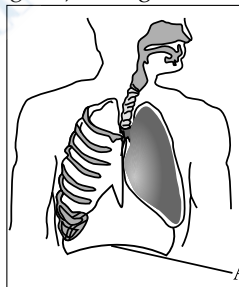
10. It is important to balance the chemical equations to satisfy the law of conservation of mass. Which of the following statements of the law is incorrect?
- (a) The total mass of the elements present in the reactants is equal to the total mass of the elements present in the products.  
 (b) The number of atoms of each element remains the same, before and after a chemical reaction.  
 (c) The chemical composition of the reactants is the same before and after the reaction.  
 (d) Mass can neither be created nor can it be destroyed in a chemical reaction.
11. Consider the following statements in connection with the functions of the blood vessels marked A and B in the diagram of a human heart as shown.



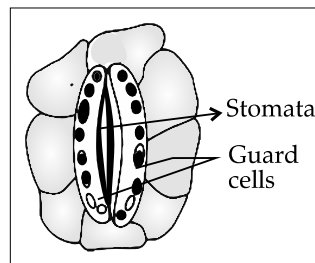
- (i) Blood vessel A – It carries carbon dioxide rich blood to the lungs.  
 (ii) Blood vessel B – It carries oxygen rich blood from the lungs.  
 (iii) Blood vessel B – Left atrium relaxes as it receives blood from this blood vessel.  
 (iv) Blood vessel A – Right atrium has thick muscular wall as it has to pump blood to this blood vessel.

The correct statements are

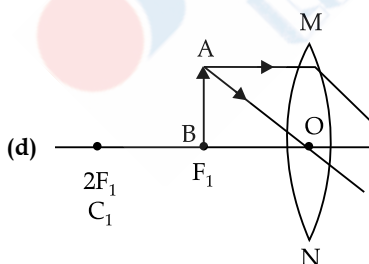
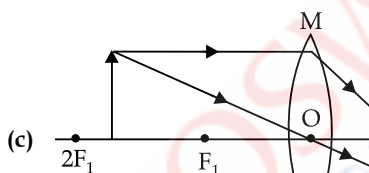
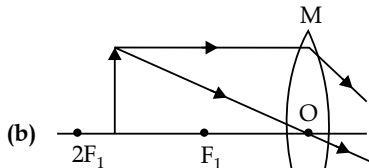
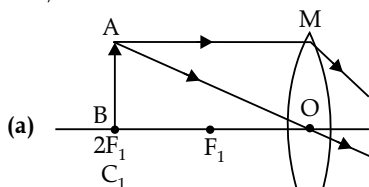
- (a) (i) and (ii) only      (b) (ii) and (iii) only  
 (c) (ii), (iii) and (iv)      (d) (i), (ii) and (iii)
12. In living organisms during respiration which of the following products are not formed if oxygen is not available?
- (a) Carbon dioxide + Water  
 (b) Carbon dioxide + Alcohol  
 (c) Lactic acid + Alcohol  
 (d) Carbon dioxide + Lactic Acid
13. The correct statements with references to single celled organisms are
- (i) Complex substances are not broken down into simpler substances.  
 (ii) Simple diffusion is sufficient to meet the requirements of exchange of gases.  
 (iii) Specialised tissues perform different functions in the organism.  
 (iv) Entire surface of the organism is in contact with the environment for taking in food.
- (a) (i) and (iii)      (b) (ii) and (iii)  
 (c) (ii) and (iv)      (d) (i) and (iv)
14. Which one among the following is not removed as a waste product from the body of a plant?
- (a) Resins and Gums      (b) Urea  
 (c) Dry Leaves      (d) Excess Water
15. Which of the following statements are correct in reference to the role of A (shown in the given diagram) during a breathing cycle in human beings?



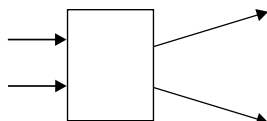
- (i) It helps to decrease the residual volume of air in lungs.  
 (ii) It flattens as we inhale.  
 (iii) It gets raised as we inhale.  
 (iv) It helps the chest cavity to become larger.
- (a) (ii) and (iv)      (b) (iii) and (iv)  
 (c) (i) and (ii)      (d) (i), (ii) and (iv)
16. Which one of the following conditions is true for the state of stomata of a green leaf shown in the given diagram?



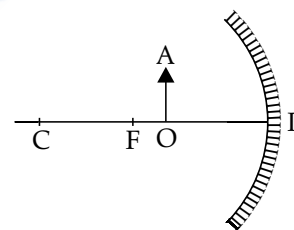
- (a) Large amount of water flows into the guard cells.  
 (b) Gaseous exchange is occurring in large amount.  
 (c) Large amount of water flows out from the guard cells.  
 (d) Large amount of sugar collects in the guard cells.
17. In which of the following is a concave mirror used?  
 (a) A solar cooker  
 (b) A rear view mirror in vehicles  
 (c) A safety mirror in shopping malls  
 (d) In viewing full size image of distant tall buildings
18. A student wants to obtain magnified image of an object  $AB$  as on a screen. Which one of the following arrangements shows the correct position of  $AB$  for him/her to be successful?



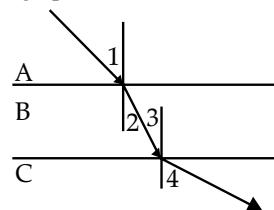
19. The following diagram shows the use of an optical device to perform an experiment of light. As per the arrangement shown, the optical device is likely to be a;



- (a) Concave mirror  
 (b) Concave lens  
 (c) Convex mirror  
 (d) Convex lens
20. A ray of light starting from air passes through medium A of refractive index 1.50, enters medium B of refractive index 1.33 and finally enters medium C of refractive index 2.42. If this ray emerges out in air from C, then for which of the following pairs of media the bending of light is least?  
 (a) air-A (b) A-B  
 (c) B-C (d) C-air
21. Which of the following statements is not true for scattering of light?  
 (a) Colour of the scattered light depends on the size of particles of the atmosphere.  
 (b) Red light is least scattered in the atmosphere.  
 (c) Scattering of light takes place as various colours of white light travel with different speed in air.  
 (d) The fine particles in the atmospheric air scatter the blue light more strongly than red. So the scattered blue light enters our eyes.
22. For the diagram shown, according to the new Cartesian sign convention the magnification of the image formed will have the following specifications:

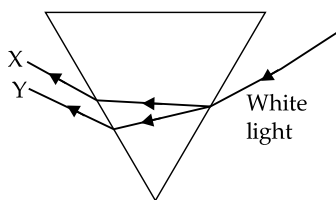


- (a) Sign – Positive, Value – Less than 1  
 (b) Sign – Positive, Value – More than 1  
 (c) Sign – Negative, Value – Less than 1  
 (d) Sign – Negative, Value – More than 1
23. A ray of light is incident as shown. If A, B and C are three different transparent media, then which among the following options is true for the given diagram?



- (a)  $\angle 1 > \angle 4$  (b)  $\angle 1 < \angle 2$   
 (c)  $\angle 3 = \angle 2$  (d)  $\angle 3 > \angle 4$
24. In the diagram given below, X and Y are the end colours of the spectrum of white light. The colour of 'Y' represents the





- (a) Colour of sky as seen from earth during the day.  
 (b) Colour of the sky as seen from the moon.  
 (c) Colour used to paint the danger signals.  
 (d) Colour of sun at the time of noon.

### SECTION-B

Section-B consists of 24 questions (Q. No. 25 to 48). Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.

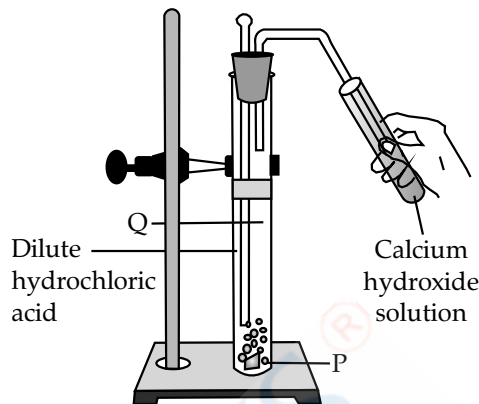
25. Which one of the following reactions is categorised as thermal decomposition reaction?  
 (a)  $2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$   
 (b)  $2\text{AgBr}(\text{s}) \rightarrow 2\text{Ag}(\text{s}) + \text{Br}_2(\text{g})$   
 (c)  $2\text{AgCl}(\text{s}) \rightarrow 2\text{Ag}(\text{s}) + \text{Cl}_2(\text{g})$   
 (d)  $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$
26. Consider the pH value of the following acidic samples:

S.No.	Sample	pH Value
1.	Lemon Juice	2.2
2.	Gastric Juice	1.2
3.	Vinegar	3.76
4.	Dil. Acetic acid	3.0

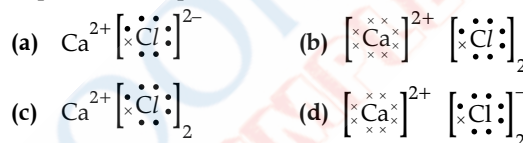
The decreasing order of their  $\text{H}^+$  ion concentration is

- (a)  $3 > 4 > 1 > 2$       (b)  $2 > 1 > 3 > 4$   
 (c)  $2 > 1 > 4 > 3$       (d)  $3 > 4 > 2 > 1$
27. Study the experimental set up shown in given figure and choose the correct option from the following:

	P	Q	Change observed in calcium hydroxide solution
(a)	$\text{K}_2\text{CO}_3$	$\text{Cl}_2$ gas	No change
(b)	$\text{KHCO}_3$	$\text{CO}_2$ gas	No change
(c)	$\text{KHCO}_3$	$\text{H}_2$ gas	Turns milky
(d)	$\text{K}_2\text{CO}_3$	$\text{CO}_2$ gas	Turns milky



28. Which one of the following structures correctly depicts the compound  $\text{CaCl}_2$ ?



29. The pair(s) which will show displacement reaction is/are  
 (i)  $\text{NaCl}$  solution and copper metal  
 (ii)  $\text{AgNO}_3$  solution and copper metal  
 (iii)  $\text{Al}_2(\text{SO}_4)_3$  solution and magnesium metal  
 (iv)  $\text{ZnSO}_4$  solution and iron metal  
 (a) (ii) only      (b) (ii) and (iii)  
 (c) (iii) and (iv)      (d) (i) and (ii)
30. Which of the following salts do not have the water of crystallisation?  
 (i) Bleaching Powder      (ii) Plaster of Paris  
 (iii) Washing soda      (iv) Baking soda  
 (a) (ii) and (iv)      (b) (i) and (iii)  
 (c) (ii) and (iii)      (d) (i) and (iv)

Question No. 31-35 consists 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 but (R) is not the correct explanation of (A).  
 (c) (A) is true but (R) is false.  
 (d) (A) is false but (R) is true.
31. **Assertion (A)** : Sodium hydrogen carbonate is used as an ingredient in antacids.  
**Reason (R)** :  $\text{NaHCO}_3$  is a mild non-corrosive basic salt.
32. **Assertion (A)** : Burning of natural gas is an endothermic process.  
**Reason (R)** : Methane gas combines with oxygen to produce carbon dioxide and water.
33. **Assertion (A)** : Nitrogen is an essential element for plant growth and is taken up by plants in the form of inorganic nitrates or nitrites.  
**Reason (R)** : The soil is the nearest and richest source of raw materials like Nitrogen, Phosphorus and other minerals for the plants.

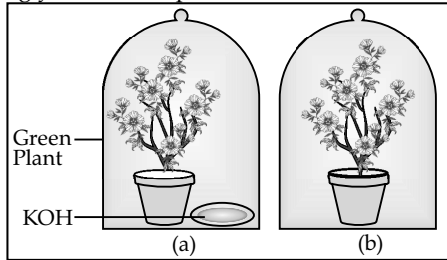
34. **Assertion (A)** : Sun appears reddish at the time of Sunrise and Sunset.

**Reason (R)** : Distance travelled by sunlight in the atmosphere is lesser during sunrise and sunset as compared to noon.

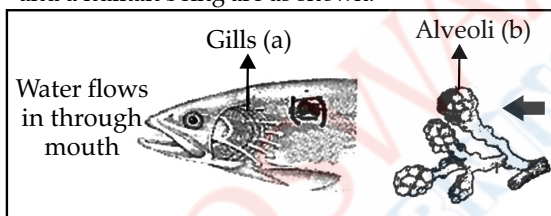
35. **Assertion (A)** : Hydrochloric acid helps in the digestion of food in the stomach.

**Reason (R)** : Hydrochloric acid creates an acidic medium to activate protein digesting enzymes.

36. A student was asked to write a stepwise procedure to demonstrate that carbon dioxide is necessary for photosynthesis. He wrote the following steps. The wrongly worded step is:

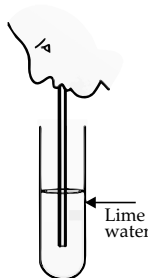


- (a) Both potted plants are kept in dark room for at least three days.  
 (b) Bottom of the bell jars is sealed to make them air tight.  
 (c) Both potted plants are kept in sunlight after the starch test.  
 (d) A leaf from both the plants is taken to test the presence of starch.
37. Respiratory structures of two different animals—a fish and a human being are as shown.



Observe (a) and (b) and select one characteristic that holds true for both of them.

- (a) Both are placed internally in the body of animal.  
 (b) Both have thin and moist surface for gaseous exchange.  
 (c) Both are poorly supplied with blood vessels to conserve energy.  
 (d) In both the blood returns to the heart after being oxygenated.
38. Observe the diagram of an activity given below. What does it help to conclude, when the person exhales into the test-tube?



- (a) Percentage of carbon dioxide is more in inhaled air.

(b) Fermentation occurs in the presence of oxygen.

(c) Percentage of carbon dioxide is more in the exhaled air.

(d) Fermentation occurs in the presence of carbon dioxide.

39. If a lens can converge the sun rays at a point 20 cm, away from its optical centre, the power of this lens is

(a) +2D (b) -2D

(c) +5D (d) -5D

40. The radius of curvature of a converging mirror is 30 cm. At what distance from the mirror should an object be placed as to obtain a virtual image?

(a) Infinity

(b) 30 cm

(c) Between 15 cm and 30 cm

(d) Between 0 cm and 15 cm

41. The length of small intestine in a deer is more as compared to the length of small intestine of a tiger. The reason for this is

(a) Mode of intake of food.

(b) Type of food consumed.

(c) Presence or absence of villi in intestines.

(d) Presence or absence of digestive enzymes.

42. Identify the two components of phloem tissue that help in transportation of food in plants.

(a) Phloem parenchyma & sieve tubes

(b) Sieve tubes & companion cells

(c) Phloem parenchyma & companion cells

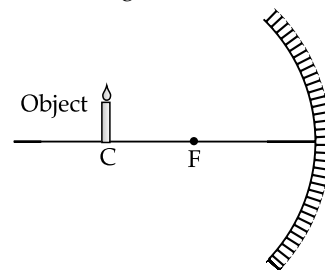
(d) Phloem fibres and sieve tubes

43. A converging lens forms a three times magnified image of an object, which can be taken on a screen. If the focal length of the lens is 30 cm, then the distance of the object from the lens is:

(a) -55 cm (b) -50 cm

(c) -45 cm (d) -40 cm

44. Which of the following statements is not true in reference to the diagram shown above?



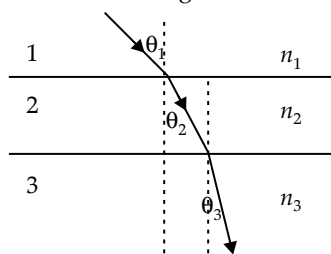
(a) Image formed is real.

(b) Image formed is enlarged.

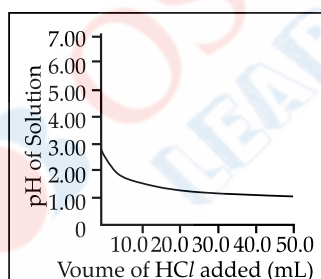
(c) Image is formed at a distance equal to double the focal length.

(d) Image formed is inverted.

45. In the diagram shown above  $n_1$ ,  $n_2$  and  $n_3$  are refractive indices of the media 1, 2 and 3 respectively. Which one of the following is true in this case?



- (a)  $n_1 = n_2$                       (b)  $n_1 > n_2$   
 (c)  $n_2 > n_3$                       (d)  $n_3 > n_1$
46. The refractive index of medium A is 1.5 and that of medium B is 1.33. If the speed of light in air is  $3 \times 10^8$  m/s, what is the speed of light in medium A and B respectively?
- (a)  $2 \times 10^8$  m/s and  $1.33 \times 10^8$  m/s  
 (b)  $1.33 \times 10^8$  m/s and  $2 \times 10^8$  m/s  
 (c)  $2.25 \times 10^8$  m/s and  $2 \times 10^8$  m/s  
 (d)  $2 \times 10^8$  m/s and  $2.25 \times 10^8$  m/s
47. An object of height 4 cm is kept at a distance of 30 cm from the pole of a diverging mirror. If the focal length of the mirror is 10 cm, the height of the image formed is
- (a) +3.0 cm                      (b) +2.5 cm  
 (c) +1.0 cm                      (d) +0.75 cm
48. 50.0 mL of tap water was taken in a beaker. Hydrochloric acid was added drop by drop to water. The temperature and pH of the solution was noted. The following graph was obtained. Choose the correction statements related to this activity.



- (i) The process of dissolving an acid in water is highly endothermic.  
 (ii) The pH of the solution increases rapidly on addition of acid.  
 (iii) The pH of the solution decreases rapidly on addition of acid.  
 (iv) The pH of tap water was around 7.0
- (a) (i) and (ii)                      (b) (i) and (iii)  
 (c) (iii) and (iv)                      (d) (ii) and (iv)

### SECTION-C

Section-C consists of three cases followed by questions. There are a total of 12 questions (Q. No. 49 to 60) in this section. Attempt any 10 questions from this section. The first attempted 10 questions would be evaluated.

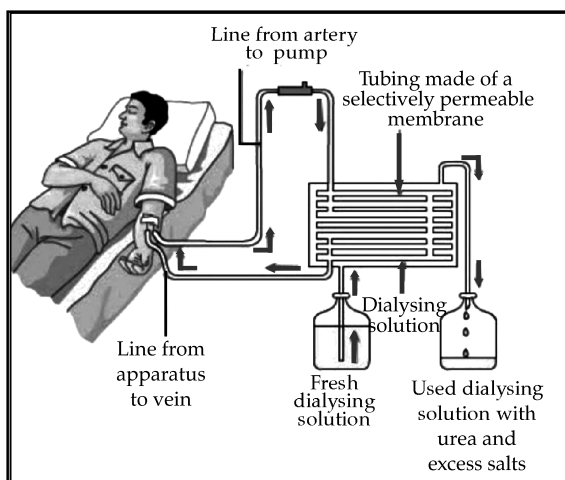
**Case-I :** A student, took four metals P, Q, R and S and carried out different experiments to study the properties of metals. Some of the observations were :

- All metals could not be cut with knife except metal R.
- Metal P combined with oxygen to form an oxide  $M_2O_3$  which reacted with both acids and bases.
- Reaction with water.  
 P – Did not react either with cold or hot water but reacted with steam  
 Q – Reacted with hot water and the metal started floating  
 R – Reaction violently with cold water.  
 S – Did not react with water at all.

Based on the above observations answer the following:

49. Out of the given metals, the one which needs to be stored using kerosene is
- (a) P                                      (b) R  
 (c) S                                      (d) Q
50. Out of the given metals, the metal Q is
- (a) Iron                                      (b) Zinc  
 (c) Potassium                              (d) Magnesium
51. Metal which forms amphoteric oxides is
- (a) P                                      (b) Q  
 (c) R                                      (d) S
52. The increasing order of the reactivity of the four metals is
- (a)  $P < Q < R < S$                       (b)  $S < R < Q < P$   
 (c)  $S < P < Q < R$                       (d)  $P < R < Q < S$

**Case-II :** The figure shown below represents a common type of dialysis called as Haemodialysis. It removes waste products from the blood, such as excess salts, and urea which are insufficiently removed by the kidney in patients with kidney failure. During the procedure, the patient's blood is cleaned by filtration through a series of semi-permeable membranes before being returned to the blood of the patients. On the basis of this, answer the following questions:



53. The haemodialyser has semi-permeable lining of tubes which help to:
- To maintain osmotic pressure of blood.
  - To filter nitrogenous wastes from the dialysing solution.
  - In passing the waste products in the dialysing solution.
  - To pump purified blood back into the body of the patient.
54. Which one of the following is not a function of Artificial Kidney?
- To remove nitrogenous wastes from the blood.
  - To remove excess fluids from the blood.
  - To reabsorb essential nutrients from the blood.
  - To filter and purify the blood.
55. The 'used dialysing' solution is rich in;
- Urea and excess salts
  - Blood cells
  - Lymph
  - Proteins
56. Which part of the nephron in human kidney, serves the function of reabsorption of certain substances?
- Glomerulus
  - Bowmans Capsule
  - Tubules
  - Collecting duct
- Case III :** A compound microscope is an instrument which consists of two lenses  $L_1$  and  $L_2$ . The lens  $L_1$  called objective, forms a real, inverted and magnified image of the given object. This serves as the object for the second lens  $L_2$ ; the eye piece. The eye piece functions like a simple microscope or magnifier. It produces the final image, which is inverted with respect to the original object, enlarged and virtual.
57. What types of lenses must be  $L_1$  and  $L_2$ ?
- Both concave
  - Both convex
  - $L_1$  – concave and  $L_2$  – convex
  - $L_1$  – convex and  $L_2$  – concave
58. What is the value and sign of magnification (according to the new Cartesian sign convention) of the image formed by  $L_1$ ?
- Value = Less than 1 and Sign = Positive
  - Value = More than 1 and Sign = Positive
  - Value = Less than 1 and Sign = Negative
  - Value = More than 1 and Sign = Negative
59. What is the value and sign of magnification (according to the new Cartesian sign convention) of the image formed by  $L_2$ ?
- Value = Less than 1 and Sign = Positive
  - Value = More than 1 and Sign = Positive
  - Value = Less than 1 and Sign = Negative
  - Value = More than 1 and Sign = Negative
60. If power of the eyepiece ( $L_2$ ) is 5 diopters and it forms an image at a distance of 80 cm from its optical centre, at what distance should the object be?
- 12 cm
  - 16 cm
  - 18 cm
  - 20 cm

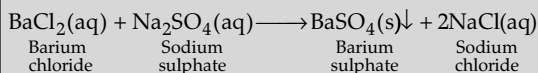
□□□

## SOLUTIONS

### SECTION-A

1. (c) White,  $\text{BaSO}_4$

**Explanation:** On adding a solution of barium chloride to sodium sulphate solution, a white colour precipitate of barium sulphate is formed along with the formation of sodium chloride salt. The chemical reaction is as follows:



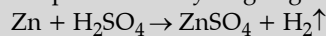
2. (a) (i) and (iii)

**Explanation:** Most of the metal oxides are insoluble in water but sodium oxide ( $\text{Na}_2\text{O}$ ) and potassium oxide ( $\text{K}_2\text{O}$ ) dissolve in water to form alkalies. On the other hand, most non-metallic oxides dissolve in water to form acids.

3. (d) Hydrogen which while burning produces a popping sound.

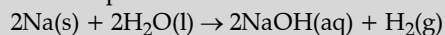


**Explanation:** Zinc reacts with dilute sulphuric acid to form zinc sulphate and hydrogen gas. When a burning candle is brought near the hydrogen gas, it burns with a pop sound which confirms the presence of hydrogen gas.



4. (b)  $2\text{Na(s)} + 2\text{H}_2\text{O(l)} \rightarrow 2\text{NaOH(aq)} + \text{H}_2\text{(g)}$

**Explanation:** Sodium reacts with water to form sodium hydroxide solution and hydrogen gas. The balanced chemical equation for the given reaction is represented as:



5. (c) (ii) and (iii)

**Explanation:** Lactic acid is present in sour milk and methanoic acid is present in ant sting.

6. (c) exothermic reaction

**Explanation:** The given reaction is an example of respiration. During respiration, energy is being released. Therefore, it is an exothermic reaction.

7. (c) (i) and (ii) only

**Explanation:** In this reaction,  $\text{MnO}_2$  is losing oxygen to form  $\text{MnCl}_2$ , so manganese dioxide ( $\text{MnO}_2$ ) is being reduced to manganese dichloride ( $\text{MnCl}_2$ ). On the other hand,  $\text{HCl}$  is losing hydrogen to form  $\text{Cl}_2$ , so hydrochloric acid ( $\text{HCl}$ ) is being oxidised to chlorine ( $\text{Cl}_2$ ). Therefore, manganese dioxide ( $\text{MnO}_2$ ) is the oxidising agent while hydrochloric acid ( $\text{HCl}$ ) is the reducing agent.

8. (d) Bases turn pink when a drop of phenolphthalein is added to them.

**Explanation:** Phenolphthalein changes color from colourless to pink in basic solution. Rest all are the properties of acids.

9. (d) **Salt :** Sodium Acetate, **Parent acid :**  $\text{CH}_3\text{COOH}$ , **Parent Base :**  $\text{NaOH}$ , **Nature of salt:** Basic.

**Explanation:** A basic salt is made up of combination of a weak acid and a strong base. Since, sodium acetate is made up of weak acid (acetic acid) and a strong base ( $\text{NaOH}$ ), it is basic in nature.

10. (c) The chemical composition of the reactants is the same before and after the reaction.

**Explanation:** During a chemical reaction, atoms or molecules of reactants collide to form new bonds and break old bonds the reacting atoms rearrange themselves to form the product. As a result, the chemical composition of the reactants gets modified after the reaction. Hence, this is the incorrect statement.

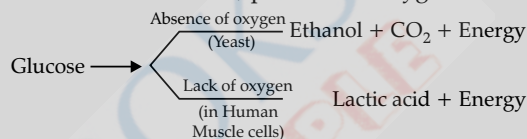
11. (d) (i), (ii) and (iii)

**Explanation:** Blood vessel A is the pulmonary artery and blood vessel B is a pulmonary vein. The pulmonary vein carries oxygenated blood from the lungs to the left atrium that relaxes to receive the blood from this blood vessel.

The pulmonary artery carries deoxygenated blood from the right ventricle of the heart to the lungs.

12. (a) Carbon dioxide + water

**Explanation:** During respiration, under anaerobic conditions, carbon dioxide and water is not formed. Water is produced only under aerobic conditions *i.e.*, presence of oxygen.



13. (c) (ii) and (iv)

**Explanation:** In single celled organisms like *Amoeba*, the complex food substances are broken down into simpler substances by the process of digestion that takes place inside the food vacuole. Simple diffusion is sufficient to meet the requirement of the exchange of gases. Specialised tissues are not formed because the tissue is formed by a group of cells, not a single cell. The entire surface of the organism is in direct contact with the environment so that they can capture their food.

14. (b) Urea

**Explanation:** Urea is not formed in the plants. The excretory products that are produced by the plants are resins, gums, latex, dry leaves and excess water.

15. (a) (ii) and (iv)

**Explanation:** The diaphragm contracts and flattens during inhalation to increase the chest cavity. It gets raised and relaxed during the exhalation to push out the air from the lungs.

16. (c) Large amount of water flows out from the guard cells.

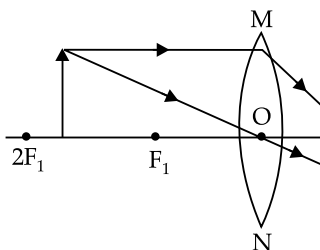
**Explanation:** The given diagram represents closed stomatal pores. The stomatal pores close when a large amount of water flows out of the guard cells due to environmental stress such as high temperature.



17. (a) A solar cooker

**Explanation:** A concave mirror is used in the solar cooker as concave mirrors absorb the entire incident light and reflect it to a single focal point. This reflected light is very powerful because it carries a lot of thermal energy.

18. (c)



**Explanation:** The students want to obtain a magnified image on the screen then the position of the object should be between F and 2F because only real image can be formed on the screen.

19. (b) Concave lens

**Explanation:** In the given diagram, rays are diverging from the optical device. Thus, it is a concave lens, which is also known as diverging lens.

20. (b) A-B

**Explanation:** The difference of refractive index is minimum when the ray of light travels from medium A to medium B. Thus, the change in speed of light is minimum for A-B interface and therefore, the bending of light is least for A-B interface.

21. (c) Scattering of light takes place as various colours of white light travel with different speed in air.

**Explanation:** When a white light enters the atmosphere, it is scattered by small particles present in the atmosphere according to their wavelengths. As the red light has the highest wavelength among all the colours in the visible light, it is scattered the least but blue light scatters the most.

22. (b) Sign- Positive, Value- More than 1

**Explanation:** In the given figure, object OA is placed in front of a concave mirror between pole and focus. Thus, a virtual, erect and enlarged image will form behind the mirror. Therefore, magnification is positive and its value should be more than 1.

23. (c)
- $\angle 3 = \angle 2$

**Explanation:** From the given diagram,  $\angle 1 > \angle 2$ ,  $\angle 4 > \angle 3$  and  $\angle 1 = \angle 4$ . From the geometry of the figure, the two normals are parallel to each other and  $\angle 2$  and  $\angle 3$  are alternate interior angles. Therefore,  $\angle 3 = \angle 2$ .

24. (c) Colour used to paint the danger signals.

**Explanation:** When white light is incident on a prism, it splits into seven colours. The red light bends the least while the violet bends the most. Thus, in the given diagram, Y represents red colour used to paint the danger signals.

### SECTION-B

25. (d)
- $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

**Explanation:** Decomposition of calcium carbonate ( $\text{CaCO}_3$ ) is an example of thermal decomposition reaction because in this reaction, a single reactant decomposes into multiple products by the action of heat.

26. (c)
- $2 > 1 > 4 > 3$

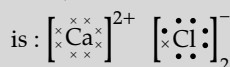
**Explanation:** The decreasing order of  $\text{H}^+$  ion concentration is  $2 > 1 > 4 > 3$ . It is because, more is the concentration of  $\text{H}^+$  ions, lesser is the value of pH.

27. (d) P –
- $\text{K}_2\text{CO}_3$
- , Q –
- $\text{CO}_2$
- gas, Change observed in calcium hydroxide solution – Turns milky.

**Explanation:** Metal carbonates or metal hydrogen carbonate upon reaction with acid lead to the formation of salt, water and carbon dioxide. The carbon dioxide gas thus produced turns the lime water milky. Therefore, P is  $\text{K}_2\text{CO}_3$ , Q is  $\text{CO}_2$  gas, and the calcium hydroxide solution *i.e.* lime water turns milky.

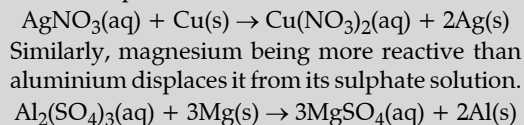
28. (d)
- $\left[ \begin{array}{c} \times \times \times \\ \times \text{Ca} \times \\ \times \times \times \end{array} \right]^{2+} \left[ \begin{array}{c} \cdot \cdot \cdot \\ \times \text{Cl} \cdot \\ \cdot \cdot \cdot \end{array} \right]_2^-$

**Explanation:** Calcium with electronic configuration 2, 8, 8, 2 loses two electrons to form  $\text{Ca}^{2+}$  ion and attains noble gas configuration whereas, chlorine with electronic configuration 2, 8, 7 gains one electron to form  $\text{Cl}^-$  ion. Therefore, two electrons lost by calcium are gained by two chlorine atoms to form  $\text{CaCl}_2$ . Thus, the correct structure for calcium chloride



29. (b) (ii) and (iii)

**Explanation:** A displacement reaction is a chemical reaction in which a more reactive element displaces a less reactive element from its compound. Since, Cu is more reactive than Ag; it can displace Ag from its nitrate solution and show a displacement reaction.



30. (d) (i) and (iv)

**Explanation:** The chemical formula of the given salts are :

**Bleaching powder:**  $\text{CaOCl}_2$

**Plaster of Paris:**  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

**Washing soda:**  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

**Baking soda:**  $\text{NaHCO}_3$

Therefore, bleaching powder and baking soda do not have the water of crystallisation.

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

**Explanation:** Sodium hydrogen carbonate ( $\text{NaHCO}_3$ ) is used as an ingredient in antacids because being alkaline, it neutralises excess acid in the stomach and provides relief. It is a mild, non corrosive salt.

32. (d) (A) is false, but (R) is true.

**Explanation:** Burning of natural gas is an exothermic process as heat is evolved in the process. Burning of methane gas leads to the production of carbon dioxide, water and heat.

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

**Explanation:** Nitrogen is an essential element for plant growth but it cannot fix atmospheric nitrogen directly. Thus, is taken up by plants in the form of inorganic nitrates or nitrites, or ammonia. Soil is composed of minerals such as nitrogen, phosphorous and potassium.

34. (c) (A) is true, but (R) is false.

**Explanation:** The Sun appears reddish at the time of sunrise or sunset because light from the Sun near the horizon passes through thicker layers of air and larger distance in the earth's atmosphere before reaching our eyes. The distance covered by sunlight is larger in the case of sunrise and sunset where it is lesser during noon.

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

**Explanation:** The gastric glands present in the wall of the stomach release hydrochloric acid, pepsinogen and mucus. Hydrochloric acid provides the acidic medium for the activation of pepsinogen into pepsin.

36. (c) Both potted plants are kept in sunlight after the starch test.

**Explanation:** The given experiment is performed to test the role of carbon dioxide in photosynthesis. In fig. (a) KOH is used to absorb carbon dioxide. The steps are as follows:

- (i) Two healthy potted plants are taken and kept in dark for three days so that all starch produced is consumed.
- (ii) The potted plants are then kept in airtight situation inside the bell jars to prevent further entry of carbon dioxide into it.
- (iii) Then the plants are kept in sunlight for two hours before the starch test so that plant can undergo photosynthesis and produce new starch.
- (iv) A leaf was plucked from each plant to carry the starch detection test.

37. (b) Both have thin and moist surface for gaseous exchange.

**Explanation:** Both the structures, gills and alveoli have thin and moist surface which help in the easy diffusion of respiratory gases. Gills are located externally beneath the operculum of a fish while alveoli are located internally in the lungs of humans. Both are richly supplied with blood to facilitate exchange of gases.

In the case of humans, the blood returns to the heart after it becomes oxygenated while in case of fish, they have single circulation so blood does not enter the heart after being oxygenated.

38. (c) Percentage of carbon dioxide is more in the exhaled air.

**Explanation:** When we blow through a pipe, the exhaled air contains more percentage of carbon dioxide, which turns the lime water milky. So, the given test confirms the presence of high percentage of carbon dioxide in the exhaled air.

39. (c) + 5 D

**Explanation:** Focal length of the converging lens (convex lens),  $f = +20 \text{ cm} = 0.20 \text{ m}$   
Power of the lens is given as:

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

$$\text{Or } P = \frac{1}{0.20} = +5 \text{ D}$$

40. (d) Between 0 cm and 15 cm

**Explanation:** Radius of curvature of converging mirror = 30 cm

To obtain virtual image, in case of concave mirror (converging mirror), object should be between pole and focus.

Using Focal length,  $f = \frac{\text{Radius of curvature}}{2}$

Or  $f = \frac{30}{2} = 15 \text{ cm}$

Therefore, the object should be placed between 0 cm and 15 cm.

41. (b) Type of food consumed.

**Explanation:** Herbivores like deer consume plants that contain cellulose. Hence, they need a longer small intestine to allow the cellulose to be digested. Carnivores like tiger eat meat. Since, meat is easier to digest as compared to cellulose; hence, they have a shorter small intestine compared to length of small intestine of deer (herbivores).

42. (b) Sieve tubes & companion cells

**Explanation:** The translocation of food and other substances takes place in the sieve tubes with the help of adjacent companion cells both in upward and downward directions. Phloem parenchyma helps in food storage and phloem fiber gives strength to the plant.

43. (d) -40 cm

**Explanation:** Magnification of convex lens,  $m = -3$

Focal length,  $f = 30 \text{ cm}$

Object distance,  $u = ?$

As we know, magnification,  $m = \frac{v}{u} = -3$

Or  $v = -3u$

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

$$\frac{1}{-3u} - \frac{1}{u} = \frac{1}{30}$$

$$-\frac{4}{3} \times \frac{1}{u} = \frac{1}{30}$$

$$u = -40 \text{ cm}$$

44. (c) Image is formed at a distance equal to double the focal length.

**Explanation:** Since, the candle is at the centre of curvature of the concave lens, the image will form at the centre of curvature of the mirror itself. Hence, the image formed will be real, inverted and of same size as that of the candle.

45. (d)  $n_3 > n_1$

**Explanation:** When the light enters from optically rarer to optically denser medium, it bends towards the normal. While travelling from  $n_1$  to  $n_2$ , light bends towards the normal, so  $n_2 > n_1$ .

Similarly,  $n_3 > n_2$

Therefore,  $n_3 > n_1$

46. (d)  $2 \times 10^8 \text{ m/s}$  and  $2.25 \times 10^8 \text{ m/s}$

**Explanation:** Speed of light in air,  $c = 3 \times 10^8 \text{ m/s}$   
Let the speed of light in medium A and B be  $v_A$  and  $v_B$  respectively.

Speed of light in a medium of refractive index  $n$  is given by :

$$v = \frac{c}{n}$$

Thus,  $v_A = 3 \times \frac{10^8}{1.5} = 2 \times 10^8 \text{ m/s}$

Now,  $v_B = 3 \times \frac{10^8}{1.33} = 2.25 \times 10^8 \text{ m/s}$

47. (c) +1.0 cm

**Explanation:** Height of the object,  $h = 4 \text{ cm}$

Object distance,  $u = -30 \text{ cm}$

Focal length,  $f = 10 \text{ cm}$  (for diverging mirror)

Using mirror formula,

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

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

$$\frac{u}{v} = \left( \frac{-30}{10} \right) - 1 = -4$$

$$\text{Magnification, } m = \frac{\text{Image height}}{\text{Object height}} = \frac{h_i}{h_o}$$

$$= \frac{(-v)}{u} = \frac{1}{4}$$

$$\text{Image height (} h_i \text{)} = \frac{h}{4} = \frac{4}{4} = +1 \text{ cm}$$

48. (c) (iii) and (iv)

**Explanation:** Based on the given graph, the pH of the solution decreases as the volume of the added HCl increases. This means, more is the concentration of the acid, less is the pH of the solution. Also, the pH of tap water is around 7.0.

<b>SECTION-C</b>
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49. (b) R

**Explanation:** Metal R is sodium that can be cut by knife and needs to be stored under kerosene because it reacts violently with cold water.

50. (d) Magnesium

**Explanation:** Metal Q is magnesium as magnesium reacts with hot water to form magnesium hydroxide and hydrogen. It also starts floating due to the bubbles of hydrogen gas sticking to its surface.

51. (a) P

**Explanation:** Metal P forms an oxide  $M_2O_3$ , which show both acidic as well as basic behaviour. Such metal oxides, which react with both acids as well as bases to produce salts and water, are known as amphoteric oxides.

52. (c)  $S < P < Q < R$ 

**Explanation:** Since, metal S did not react with water, it is the least reactive metal. Metal P is more reactive than S as it did not react either with cold or hot water but reacted with steam. Metal Q is more reactive than P because it reacted with hot water. Metal R is the most reactive metal as it reacted violently with cold water. Therefore, the order of reactivity of metals is  $S < P < Q < R$ .

53. (c) In passing the waste products in the dialysing solution.

**Explanation:** Haemodialyser helps in the passing of nitrogenous waste products such as urea in the dialysing solution. During this passage, the waste products from the blood pass into the dialysing fluid through diffusion and the purified blood is pumped back into the patient.

54. (c) To reabsorb essential nutrient from the blood.

**Explanation:** The artificial kidney is similar to normal kidney except the process of reabsorption of essential nutrients from the blood which does not occur in it.

55. (a) Urea and excess salts

**Explanation:** In artificial kidney, the used dialysing solution is rich in nitrogenous wastes like urea and excess salts. Blood cells, proteins and lymph are not removed during dialysis.

56. (c) Tubules

**Explanation:** The selective reabsorption of certain substances like sodium ion, potassium ion, glucose, salts and major amount of water occurs in the tubules of the nephron in the human kidney.

57. (b) Both convex

**Explanation:** Both the images formed by lens  $L_1$  and  $L_2$  are magnified, but the concave lens always form diminished image. Thus, both the lenses  $L_1$  and  $L_2$  are convex lens.

58. (d) Value = More than 1 and Sign = Negative

**Explanation:** Image formed by  $L_1$  is real, inverted and magnified. Thus, its magnification is negative and more than 1.

59. (b) Value = More than 1 and Sign = Positive

**Explanation:** Image formed by  $L_2$  is virtual and enlarged. Thus, its magnification should be positive and more than 1.

60. (b) 16 cm

**Explanation:** Power of the lens,  $L_2$ ,  $P = 5 \text{ D}$

Focal length of lens,  $f = \frac{1}{P}$

or  $f = \frac{1}{5} = 0.2 \text{ m or } 20 \text{ cm}$

Image distance,  $v = -80 \text{ cm}$

Object distance,  $u = ?$

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

$$\left(\frac{1}{-80}\right) - \frac{1}{u} = \frac{1}{20}$$

$$\frac{1}{u} = \frac{1}{(-80)} - \frac{1}{20}$$

$$u = -16 \text{ cm}$$

Hence, distance of object from optical centre is 16 cm on the same side.

□□□



**Term – I**

**OMR SHEET**

Booklet Series

**A**

Use English Numbers / Letters only. Use Blue / Black Ball Point Pen to write in box.

<p>Booklet Series</p> <p><input type="text"/></p> <p>(A)</p> <p>(B)</p> <p>(C)</p> <p>(D)</p> <p>Subject</p> <p><input type="text"/></p>	<p>Roll Number</p> <table border="1" style="width: 100px; height: 20px; margin-bottom: 5px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <p>0 0 0 0 0 0 0 0 0 0</p> <p>1 1 1 1 1 1 1 1 1 1</p> <p>2 2 2 2 2 2 2 2 2 2</p> <p>3 3 3 3 3 3 3 3 3 3</p> <p>4 4 4 4 4 4 4 4 4 4</p> <p>5 5 5 5 5 5 5 5 5 5</p> <p>6 6 6 6 6 6 6 6 6 6</p> <p>7 7 7 7 7 7 7 7 7 7</p> <p>8 8 8 8 8 8 8 8 8 8</p> <p>9 9 9 9 9 9 9 9 9 9</p>											<p>Name <input style="width: 100px;" type="text"/></p> <p><input style="width: 100px;" type="text"/></p> <p>Test Date <input style="width: 50px;" type="text"/></p> <p>Student's Signature <input style="width: 100px; height: 40px;" type="text"/></p>	<p>Invigilator's Signature <input style="width: 100px; height: 60px;" type="text"/></p> <p>Certified that all the entries in this section have been properly filled by the student</p>	<p>Proper Marking</p> <p>The OMR Sheet will be computer checked. Fill the circles completely and dark enough for proper detection. Use ballpen (black or blue) for marking.</p> <p>(A) (B) (C) (D)</p> <p>Avoid Improper Marking</p> <p>Partially Filled</p> <p>Lightly Filled</p>	<p>Test Center Code</p> <p>0 0</p> <p>1 1</p> <p>2 2</p> <p>3 3</p> <p>4 4</p> <p>5 5</p> <p>6 6</p> <p>7 7</p> <p>8 8</p> <p>9 9</p>

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**Darken the circle for each question.**

Q.No.	Response	Q.No.	Response	Q.No.	Response	Q.No.	Response
01	(A) (B) (C) (D)	16	(A) (B) (C) (D)	31	(A) (B) (C) (D)	46	(A) (B) (C) (D)
02	(A) (B) (C) (D)	17	(A) (B) (C) (D)	32	(A) (B) (C) (D)	47	(A) (B) (C) (D)
03	(A) (B) (C) (D)	18	(A) (B) (C) (D)	33	(A) (B) (C) (D)	48	(A) (B) (C) (D)
04	(A) (B) (C) (D)	19	(A) (B) (C) (D)	34	(A) (B) (C) (D)	49	(A) (B) (C) (D)
05	(A) (B) (C) (D)	20	(A) (B) (C) (D)	35	(A) (B) (C) (D)	50	(A) (B) (C) (D)
06	(A) (B) (C) (D)	21	(A) (B) (C) (D)	36	(A) (B) (C) (D)	51	(A) (B) (C) (D)
07	(A) (B) (C) (D)	22	(A) (B) (C) (D)	37	(A) (B) (C) (D)	52	(A) (B) (C) (D)
08	(A) (B) (C) (D)	23	(A) (B) (C) (D)	38	(A) (B) (C) (D)	53	(A) (B) (C) (D)
09	(A) (B) (C) (D)	24	(A) (B) (C) (D)	39	(A) (B) (C) (D)	54	(A) (B) (C) (D)
10	(A) (B) (C) (D)	25	(A) (B) (C) (D)	40	(A) (B) (C) (D)	55	(A) (B) (C) (D)
11	(A) (B) (C) (D)	26	(A) (B) (C) (D)	41	(A) (B) (C) (D)	56	(A) (B) (C) (D)
12	(A) (B) (C) (D)	27	(A) (B) (C) (D)	42	(A) (B) (C) (D)	57	(A) (B) (C) (D)
13	(A) (B) (C) (D)	28	(A) (B) (C) (D)	43	(A) (B) (C) (D)	58	(A) (B) (C) (D)
14	(A) (B) (C) (D)	29	(A) (B) (C) (D)	44	(A) (B) (C) (D)	59	(A) (B) (C) (D)
15	(A) (B) (C) (D)	30	(A) (B) (C) (D)	45	(A) (B) (C) (D)	60	(A) (B) (C) (D)