

# TERM-1

## SAMPLE PAPER

### SOLVED

## SCIENCE

Time Allowed: 90 Minutes

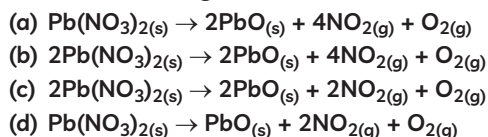
Maximum Marks: 40

**General Instructions:** Same instructions as given in the Sample Paper 1.

### SECTION - A

(Section A consists of 24 questions. Attempt any 20 questions from this section.  
The first attempted 20 questions would be evaluated.)

1. Identify the balanced chemical equation from the following:



2. Universal indicator is a mixture of several indicators and shows different colours at different concentrations of hydrogen ions in a solution.

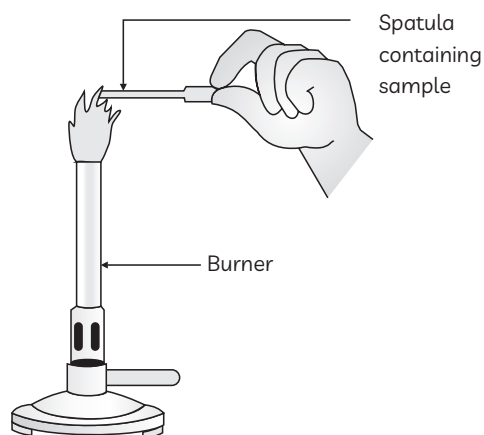
A few common substances as mentioned in column I of the table were tested with Universal indicator and their colour observed mentioned in column II.

Match the substance with the correct colour observed after testing with universal indicator.

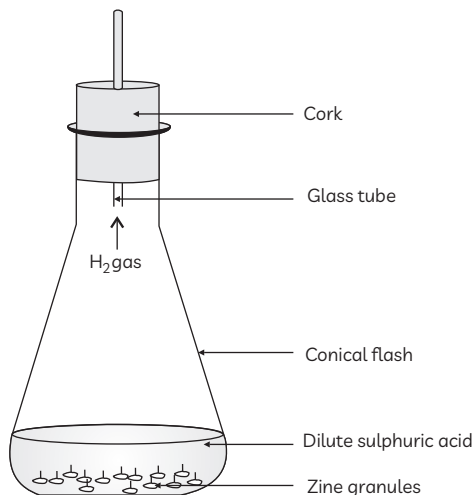
Column I	Column II
(I) Battery acid	(A) Orange yellow
(II) Water	(B) Red
(III) Tomato juice	(C) Violet
(IV) Drain cleaner	(D) Green

- (a) (I) – (B); (II) – (C); (III) – (A); (IV) – (D)  
 (b) (I) – (A); (II) – (B); (III) – (D); (IV) – (C)  
 (c) (I) – (B); (II) – (D); (III) – (A); (IV) – (C)  
 (d) (I) – (A); (II) – (D); (III) – (B); (IV) – (C)

3. Select the correct observation when salt samples such as NaCl, KI, BaCl<sub>2</sub> is taken on a metal spatula and heated directly on the flame as shown in the figure below:



- (a) The salts melt immediately  
 (b) The salts give out characteristics flame upon heating  
 (c) The salts do not melt easily  
 (d) The salts undergo sublimation
4. Which of the following characteristics can be observed when dilute sulphuric acid is added to zinc granules in a conical flask?

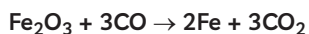


- (I) Evolution of a gas  
 (II) Increase in temperature  
 (III) decrease in temperature  
 (IV) Formation of precipitate
- (a) Only (I)  
 (b) Both (I) and (II)  
 (c) Both (II) and (IV)  
 (d) Both (I) and (IV)

5. When air is blown from mouth into a test tube containing lime water, the lime water turns milky due to the presence of which gas?

- (a) O<sub>2</sub>                      (b) N<sub>2</sub>  
 (c) CaCO<sub>3</sub>                (d) CO<sub>2</sub>

6. Consider the chemical reaction given below and identify the row containing substances oxidized and reduced:



Select the correct statements:

- (I) Fe<sub>2</sub>O<sub>3</sub> is reduced to Fe  
 (II) Fe is oxidized to Fe<sub>2</sub>O<sub>3</sub>  
 (III) CO is oxidized to CO<sub>2</sub>  
 (IV) CO<sub>2</sub> is reduced to CO

- (a) Both (I) and (III)  
 (b) Both (I) and (IV)  
 (c) Both (II) and (III)  
 (d) Both (II) and (IV)

7.  $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

The given reaction represents :

- (a) combination reaction  
 (b) displacement reaction  
 (c) decomposition reaction  
 (d) double reaction

8. What happens when sodium carbonate decahydrate is heated?

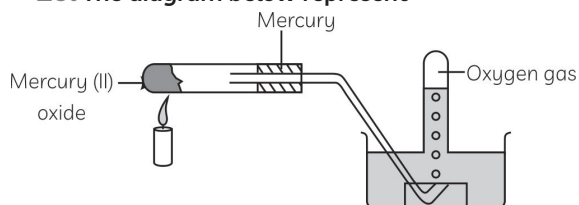
- (a) It decompose to form sodium hydroxide and water

- (b) It melts and form aqueous solution  
 (c) It becomes anhydrous  
 (d) Both (a) and (b)

9. Why is the electrolysis of a concentrated solution chloride known as chloralkali process?

- (a) Chloralkali is the name of the scientist  
 (b) Chlor for chlorine; alkali for alkaline earth metals  
 (c) Chlor for chlorine; alkali for sodium hydroxide  
 (d) Chlor for chloride; alkali for potassium hydroxide

10. The diagram below represent

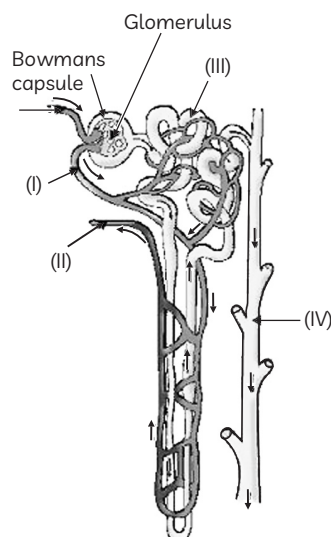


- (a) displacement reaction  
 (b) electrolysis reaction  
 (c) photodecomposition reaction  
 (d) thermal decomposition reaction

11. The characteristic processes observed in anaerobic respiration are :

- (I) presence of oxygen  
 (II) release of carbon dioxide  
 (III) release of energy  
 (IV) release of lactic acid
- (a) (I), (II) only            (b) (I), (II), (III) only  
 (c) (II), (III), (IV) only   (d) (IV) only

12. Observe the diagram of structure of a nephron.



Match the labelling referred in Column I and correlate with the function given in column II.

Column I	Column II
(I)	(A) Re-absorption of useful substances such as glucose and amino acids
(II)	(B) Carries blood to the kidneys
(III)	(C) To collect urine formed
(IV)	(D) Carries blood away from the kidneys

- (a) (I) – (D); (II) – (B); (III) – (A); (IV) – (C)  
 (b) (I) – (B); (II) – (D); (III) – (A); (IV) – (C)  
 (c) (I) – (D); (II) – (B); (III) – (C); (IV) – (A)  
 (d) (I) – (B); (II) – (D); (III) – (C); (IV) – (A)

13. Plants can use slow transport system because:

- (I) Plants have low energy needs.  
 (II) Plant bodies have a large proportion of dead cells in many tissues.  
 (III) Plants do not move.  
 (IV) Plant transport systems move energy stores from leaves and raw materials from roots.

- (a) Both (I) and (II)  
 (b) Both (III) and (IV)  
 (c) (I), (II) and (III)  
 (d) (I), (III) and (IV)

14. The part of the alimentary canal that receives bile from the liver is:

- (a) Stomach (b) Pancreas  
 (c) Small intestines (d) Large intestines

15. The xylem in plants are responsible for:

- (a) Transport of water  
 (b) Transport of food  
 (c) Transport of amino acids  
 (d) Transport of oxygen

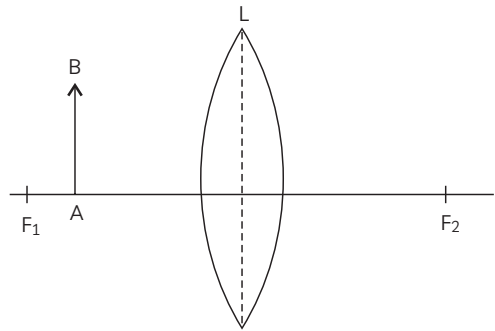
16. What will happen if platelets were absent in the blood?

- (a) No clotting of blood  
 (b) Low immunity  
 (c) Low haemoglobin  
 (d) Anaemia

17. A real and enlarged image can be obtained by using:

- (a) Concave mirror  
 (b) Convex mirror  
 (c) Plane Mirror  
 (d) Either convex or plane mirror

18. An object AB is placed in front of the lens as shown below:



Select from the table below, the row containing correct position and nature of image and magnification produced:

	Position of image	Nature of image	Magnification
(a)	Between $F_1$ and $2F_1$	Virtual and erect	$m < +1$
(b)	In front of the lens	Virtual and erect	$m > +1$
(c)	Beyond $2F_1$	Real and inverted	$m > -1$
(d)	In front of the lens	Real and inverted	$m > -1$

19. The table below gives the refractive index of a few materials and the speed of light in that medium.

Material	Refractive Index	Speed of light ( $\text{ms}^{-1}$ )
Air	1.00	$3.0 \times 10^5$
Water	1.33	$2.3 \times 10^5$
Perspex	1.49	$2.0 \times 10^5$
Glass	1.50	$2.0 \times 10^5$
Diamond	2.42	$1.2 \times 10^5$

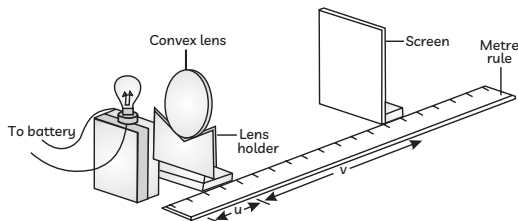
The speed of light in a medium 'A' having refractive index 2.00 will be:

- (a)  $1.5 \times 10^8$  m/s (b)  $2.0 \times 10^8$  m/s  
 (c)  $3.0 \times 10^8$  m/s (d)  $6.0 \times 10^8$  m/s

20. Convex lens of power 5 D and a concave lens of power 7.5 D are placed in contact with each other. Select the row which contains the correct answer:

Power of combination	Focal length of combination	Nature of combination of lens
(a) 12.5 D	8 cm	Convex
(b) - 2.5 D	- 40 cm	Concave
(c) +2.5 D	+ 40 cm	Convex
(d) - 2.5 D	+ 40 cm	Concave

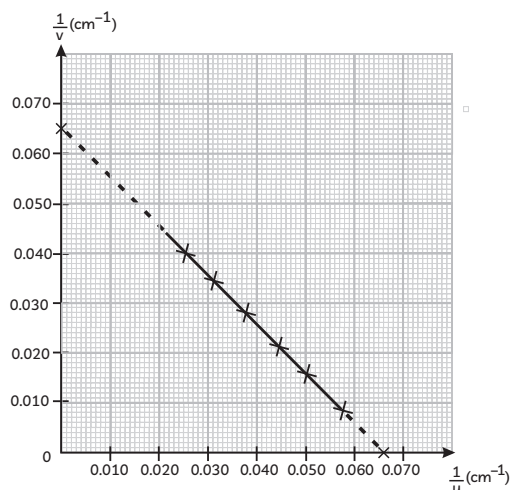
21. A student arranged the following apparatus for finding the focal length and hence power of a convex lens.



The readings are tabulated below:

Object distance, $u$ (cm)	Image distance, $v$ (cm)	$\frac{1}{u}$ ( $\text{cm}^{-1}$ )	$\frac{1}{v}$ ( $\text{cm}^{-1}$ )	$\frac{1}{u} + \frac{1}{v}$ ( $\text{cm}^{-1}$ )
40.0	24.0	0.025	0.042	0.067
35.0	26.3	0.029	0.038	0.067
30.0	30.0	0.033	0.033	0.066
25.0	37.5	0.040	0.027	0.067
20.0	60.0	0.050	0.017	0.067
18.0	90.0	0.056	0.011	0.067

He plotted a graph between  $\frac{1}{u}$  and  $\frac{1}{v}$  :



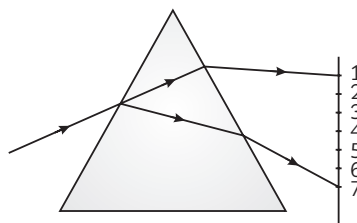
The approximate value of power of the lens is:

- (a) + 15 D                      (b) - 15 D  
(c) + 6.7 D                      (d) - 6.7 D

22. An object, 4.0 cm in size, is placed at 50.0 cm in front of concave mirror of focal length 25.0 cm. Select the row containing the correct position of image and magnification produced:

	Position of image	Magnification
(a)	+ 50 cm	- 1
(b)	+ 50 cm	+ 1
(c)	- 50 cm	- 1
(d)	- 25 cm	- 2

23. A beam of white light falls on a glass prism and split up into seven colours marked as 1 to 7 in the figure. Shyam observed the spectrum on the screen and stated that the colours positions marked 3 and 5 are similar to the colour of the sky and the colour of gold material, respectively.



Is the statement by shyam correct or not?

- (a) Not correct                      (b) Correct  
(c) Partially correct                      (d) Cannot say

24. Which of the following statements is correct regarding the propagation of light of different colours of white light in air?
- (a) Red light moves fastest  
(b) Blue light travels faster than green light  
(c) All colours of white light move with the same speed  
(d) Yellow light moves with the mean speed as the red and violet lights

## SECTION - B

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

25. Identify the substances marked X and Y from the figure below and select the row containing correct information:



	X	Y	Substance Oxidized	Substance Reduced
(a)	Cu	CuO	Cu	CuO

(b)	Fe	Fe <sub>2</sub> O <sub>3</sub>	Fe	Fe <sub>2</sub> O <sub>3</sub>
(c)	Cu	CuO	CuO	Cu
(d)	Fe	Fe <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Fe

26. Akshat is suffering from the problem of acidity after overeating. Which of the following would you suggest as a remedy?

- (a) Lemon juice                      (b) Baking soda  
(c) Vinegar                      (d) Cinnamon seeds

27. A silver spoon is kept immersed in an aqueous copper sulphate solution. What change will you observe?
- AgSO<sub>4</sub> is formed
  - Blue colour of CuSO<sub>4</sub> fades
  - Both (a) and (b)
  - No reaction occurs

28. Select the row containing correct cation and anion in calcium oxide:

	Cation	Anion
(a)	[Ca <sup>2+</sup> ]	[O <sup>2-</sup> ]
(b)	[Ca <sup>2+</sup> ]	[O <sup>-</sup> ]
(c)	[Ca <sup>+</sup> ]	[O <sup>2-</sup> ]
(d)	[Ca <sup>+</sup> ]	[O <sup>-</sup> ]

29. Why is sodium carbonate a basic salt?
- sodium carbonate is a strong base
  - sodium carbonate is a salt of strong acid and weak base
  - NaOH + H<sub>2</sub>CO<sub>3</sub> → Na<sub>2</sub>CO<sub>3</sub> + 2H<sub>2</sub>O
  - Both (b) and (c)
30. The pH of soil A is 7.5 while that of soil B is 4.5. Which of the two soils, should be treated with powdered chalk to adjust its pH?
- Soil A
  - Soil B
  - Both A and B
  - Information is insufficient

Question No. 31 to 34 consist of two statements—Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

Options:

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

31. Assertion (A): Strength of the acid decreases with dilution.

Reason (R): Ionization of an acid increase with dilution.

32. Assertion (A): Silver bromide is advised to store in dark bottles.

Reason (R): Silver bromide decomposes when exposed to light.

33. Assertion (A): Veins have thick walls to collect blood from different organs.

Reason (R): Blood in veins are not under pressure.

34. Assertion (A): When objects are observed through hot air, they appear to be moving slightly.

Reason (R): The hotter air is optically denser and the cooler air is optically rarer.

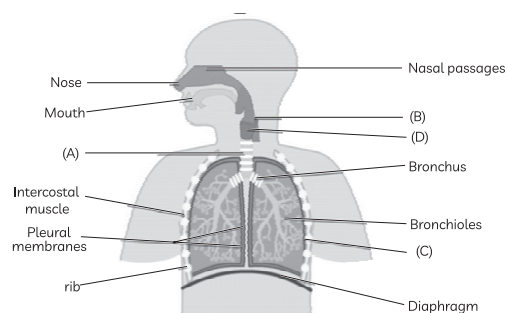
- 35.



How can she identify the gas produced in the reaction?

- by bringing matchstick near the reaction vessel
- by passing the gas in lime water
- by bringing glowing wooden splint in the test tube
- passing the gas through ammonical solution.

36. Study the figure of human respiratory system in which some parts have been labelled as A, B, C and D.



From the table given below, select the row containing incorrect identification or functions of the parts labelled.

	Part	Function
(a)	(A): Trachea	Cartilaginous tube that connects the mouth cavity to the larynx

	Part	Function
(b)	(B): Epiglottis	Small cartilaginous flap of skin that covers the glottis while swallowing food
(c)	(C): Alveoli	Provides surface where exchange of gases takes place
(d)	(D): Larynx	Enlarged part of trachea and is covered by pieces of cartilage

37. Select the correct statements:

Transpiration helps in :

- (I) Absorption and upward movement of minerals from roots to leaves
  - (II) Absorption and upward movement of soluble products of photosynthesis from roots to leaves
  - (III) Upward movement of water from roots to leaves
  - (IV) Temperature regulation
- (a) Both (I) and (III)  
 (b) Both (II) and (IV)  
 (c) (I), (II) and (III)  
 (d) (I), (III) and (IV)

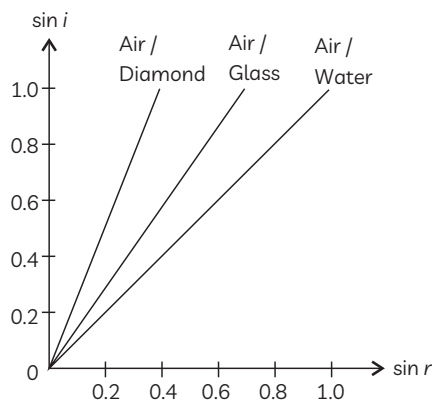
38. Select the correct observation on adding few drops of iodine solution to both the test tubes A and B:

	Test Tube A	Test Tube B
(a)	Colour changes to blue black	Colour changes to blue black
(b)	No change in colour	Colour changes to blue black
(c)	No change in colour	No change in colour
(d)	Colour changes to blue black	No change in colour

39. It is desired to obtain a magnification of -1 using a convex lens of focal length 6 cm. The position of object should be:

- (a) 6 cm in front of the lens
- (b) 12 cm in front of the lens
- (c) less than 6 cm in front of the lens
- (d) Greater than 12 cm in front of the lens

40. A teacher demonstrated an activity to study refraction of light through diamond, glass and water and plotted the graph as shown below:



Select the incorrect observations:

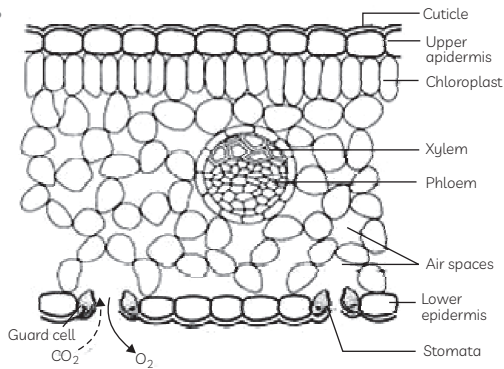
- (I) The ratio of sine of angle of refraction ( $r$ ) to the sine of angle of incidence ( $i$ ) is a constant and hence verifies Snell's law.
  - (II) The ratio  $\frac{\sin i}{\sin r}$  is greater for light travelling from Air/Water than Air/ Glass
  - (III) The value of  $\frac{\sin i}{\sin r}$  for a given pair of media depends upon the speed of light in the two media.
  - (IV) The speed of light is maximum in Diamond as the ratio  $\frac{\sin i}{\sin r}$  is maximum for light travelling from Air/Diamond.
- (a) Both (I) and (IV)    (b) Both (II) and (III)  
 (c) Both (I) and (II)    (d) Both (II) and (IV)

41. The table below lists the parts of the human heart and their main characteristic or function.

Select the row containing incorrect characteristic.

	Part of human heart	Characteristic or function
(a)	Pulmonary Arteries	Blood vessels that carry blood from heart to the lungs.
(b)	Aorta	Largest artery that carries blood from heart to different body parts.
(c)	Right Atrium	Chamber where oxygenated blood from lungs is collected.
(d)	Septum	Muscular wall which separates right and left chambers.

42.



A student noted the following observations regarding photosynthesis. Select the row containing incorrect information:

- (a) Light energy is absorbed by chlorophyll during photosynthesis.
- (b) Water molecule splits into hydrogen and oxygen with the help of chemical energy
- (c) Exchange of gases occurs only in leaves
- (d) Nitrogen required by plants is taken up in the form of inorganic nitrates or nitrites and also as organic compounds.

43. The speed of light in a medium 1 is  $2 \times 10^8$  m/s and in medium 2 it is  $1.5 \times 10^8$  m/s.

Select the correct statements from the following:

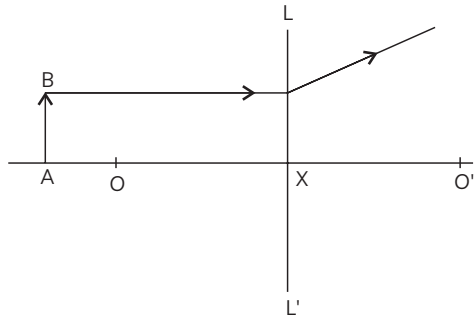
- (I) Medium 1 is an optically rarer medium as compared to medium 2
  - (II) Medium 1 is an optically denser medium as compared to medium 2
  - (III) The refractive index of medium 2 with respect to medium 1 = 1.33
  - (IV) Light will bend towards the normal when it travels from medium 2 to medium 1.
- (a) Both (II) and (III)
  - (b) Both (I) and (III)
  - (c) Both (I) and (IV)
  - (d) Both (II) and (IV)

44. A student wants to obtain the image of a candle flame on a screen placed 60 cm in front of a mirror by keeping the candle at a distance of 15 cm in front of it.

Identify the type of mirror the student should use and select the row containing the correct type of mirror to be used and linear magnification from the table below:

	Type of Mirror to be used	Magnification
(a)	Concave Mirror	- 4
(b)	Concave Mirror	+ 4
(c)	Convex Mirror	- 4
(d)	Convex Mirror	+ 4

45. Observe the incomplete ray diagram of a lens LL' given below:



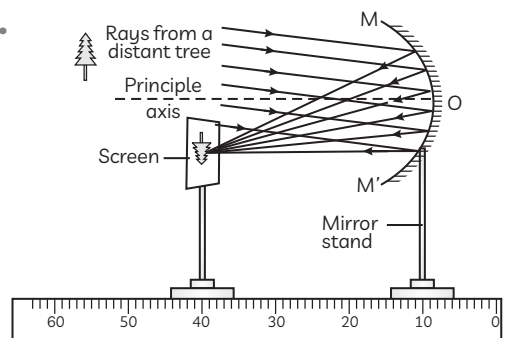
Identify the type of lens and nature of image formed from the table below:

	Type of lens	Nature of image
(a)	Concave lens	Real and inverted
(b)	Concave lens	Virtual and erect
(c)	Convex lens	Real and inverted
(d)	Convex lens	Real and inverted

46. The magnification produced by a convex mirror is always:

- (a) Smaller than +1
- (b) Equal to -1
- (c) Equal to +1
- (d) Greater than +1

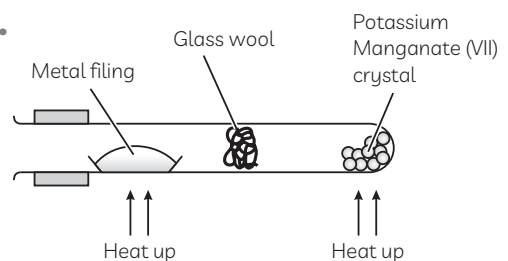
47.



The radius of curvature of the concave mirror used by the student in the above activity is:

- (a) 60 cm
- (b) 40 cm
- (c) 30 cm
- (d) 10 cm

48.



Which of the following metals do not react with oxygen even at high temperature?

- (I) Lead
  - (II) Silver
  - (III) Zinc
  - (IV) Gold
- (a) Both (I) and (II)
  - (b) Both (II) and (III)
  - (c) Both (I) and (III)
  - (d) Both (II) and (IV)

## SECTION - C

(Section C consists of three Cases followed by questions. There are a total of 12 questions in this section. Attempt any 10 questions from this section. The first attempted 10 questions would be evaluated.)

**Q. 49–52 are based on Case Study–1**

**Case 1:**

Sub-stance	pH	Colour shown by universal indicator
A	5.5	Greenish yellow
B	11	Blue
C	0	Dark red
D	9.5	Turquoise
E	3	Orange

**49.** Which of the following properties are shown by solution B?

- (I) It is the strongest base among the given substance.
  - (II) It is used in antacids.
  - (III) It turns litmus paper to blue.
  - (IV) None of the above
- (a) (I), (II)                      (b) (II), (III)  
(c) (I), (II), (III)              (d) (IV)

**50.** The substance D can not be used.

- (a) As baking soda
- (b) In fire extinguisher
- (c) In soaps and detergent
- (d) in cleaning of metals

**51.** Which substance is used in used in cakes to make them fluffy?

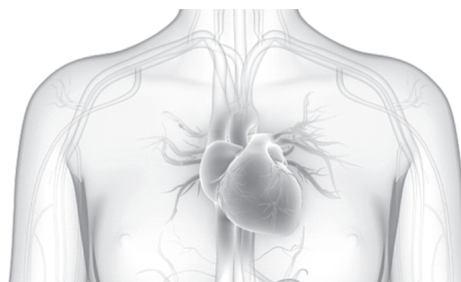
- (a) E                                  (b) B  
(c) C                                  (d) D

**52.** Choose the correct statement.

- (a) Substance E can used as preservative in pickles
- (b) Substance B can also used in preservatives
- (c) Substance C is neutral in nature
- (d) Substance D can be used in ant-acid

**Q. 53–56 are based on Case Study–2**

**Case 2:** Every day, your heart beats about 100,000 times, sending 2,000 gallons of blood surging through your body. Although it's no bigger than your fist, your heart has the mighty job of keeping blood flowing through the 60,000 miles of blood vessels that feed your organs and tissues. Any damage to the heart or its valves can reduce that pumping power, forcing the heart to work harder just to keep up with the body's demand for blood.



**53.** The chamber of the heart that contracts to pump oxygenated blood from the heart to different parts of the body is:

- (a) Left Atrium
- (b) Left Ventricle
- (c) Right Atrium
- (d) Right Ventricle

**54.** Which chamber of the heart has thickest muscular walls?

- (a) Left Atrium
- (b) Left Ventricle
- (c) Right Atrium
- (d) Right Ventricle

**55.** Mammals and birds have separate right and left chambers in their heart to:

- (I) Maintain temperature
  - (II) Help in the pumping of blood to distant body parts
  - (III) Prevent the mixing of oxygenated and deoxygenated blood inside the heart
  - (IV) Meet their high energy demands
- (a) Both (I) and (II)  
(b) Both (II) and (III)  
(c) (I), (II) and (III)  
(d) (I), (III) and (IV)

**56.** Select the incorrect statements:

- (I) Arteries have thick, elastic walls.
  - (II) Capillaries are the thinnest blood vessels
  - (III) Both arteries and capillaries have valves
  - (IV) Blood is under high pressure in veins
- (a) Both (I) and (II)  
(b) Both (II) and (IV)  
(c) Both (III) and (IV)  
(d) (I), (III) and (IV)

**Q. 57–60 are based on Case Study–3**

**Case 3:** Rayleigh scattering, named after the nineteenth-century British physicist Lord Rayleigh (John William Strutt), is the predominantly elastic



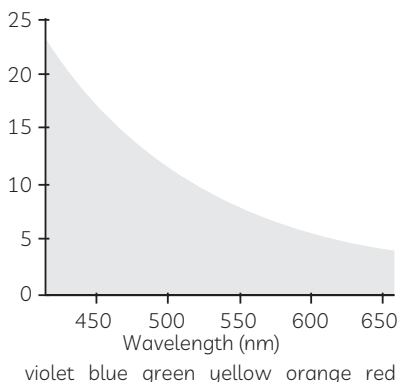
scattering of light or other electromagnetic radiation by particles much smaller than the wavelength of the radiation.

The amount of scattering is inversely proportional to the fourth power of the wavelength.

The scattering particles may be individual atoms or molecules; it can occur when light travels through transparent solids and liquids, but is most prominently seen in gases.

Rayleigh scattering of sunlight in Earth's atmosphere causes diffuse sky radiation, which is the reason for the blue color of the daytime and twilight sky, as well as the yellowish to reddish hue of the low Sun.

The percentage intensity of sunlight in the scattered light for different colours is shown below:



**57.** A student writes the following statements.

- (I) Light of all wavelengths are scattered equally
- (II) Light of longer wavelengths are scattered more strongly
- (III) Light of shorter wavelengths are scattered more strongly
- (IV) Scattering is more for coherent light

Choose from the following which of the following would be the correct statement(s):

- (a) Only (I)
- (b) Only (II)
- (c) Only (III)
- (d) Both (II) and (IV)

**58.** To an astronaut in space, the sky will appear to be:

- (a) Violet
- (b) Red
- (c) Blue
- (d) Black

**59.** The blue colour of the sky is due to the fact that:

- (a) red light is preferentially scattered.
- (b) blue is the natural colour of sky.
- (c) blue light is preferentially scattered.
- (d) red light is absorbed.

**60.** The danger signals are red in colour because it is:

- (a) strongly scattered by fog or smoke
- (b) least scattered by fog or smoke
- (c) least absorbed by fog or smoke
- (d) strongly absorbed by fog or smoke



# SOLUTION

## SECTION - A

1. (b)  $2\text{Pb}(\text{NO}_3)_{2(s)} \rightarrow 2\text{PbO}_{(s)} + 4\text{NO}_{2(g)} + \text{O}_{2(g)}$

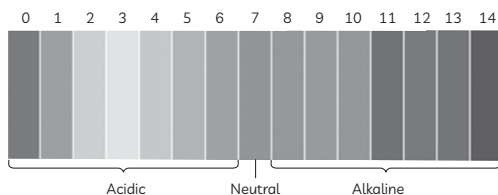
**Explanation:** A balanced chemical equation has equal number of atoms of each element on reactant and product side.

The number of atoms of each element on reactant and product side is given below:

Element	Number of atoms on Reactant side	Number of atoms on Product side
Pb	2	2
N	4	4
O	12	12

2. (c) (I) – (B); (II) – (D); (III) – (A); (IV) – (C)

**Explanation:** The colours shown by Universal indicator for different pH values is given below:



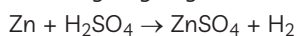
Battery acid is a strong acid and shows red colour; water is neutral and shows green colour, tomato juice contains oxalic acid, which is a weak acid, and shows orange yellow colour; drain cleaner is strongly alkaline and shows violet colour.

3. (c) *The salts do not melt easily*

**Explanation:** The salts formed between a metal and a non-metal are formed by the transfer of electrons from metal to non-metal and hence have high melting point.

4. (b) *Both (I) and (II)*

**Explanation:** The reaction between zinc granules and dilute sulphuric acid is an exothermic reaction and hydrogen gas is evolved.



5. (d)  $\text{CO}_2$

**Explanation:** Carbon dioxide gas turns limewater milky, When air is blown from

mouth into the test tube, the limewater turns milky because the air we breathe out has more amount of  $\text{CO}_2$  which converts lime into calcium carbonate ( $\text{CaCO}_3$ )

### ! Caution

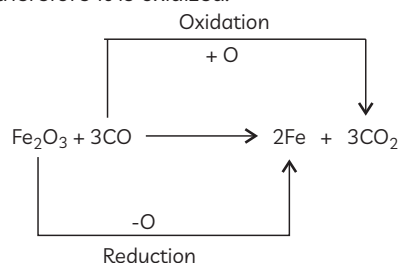
Quick lime is calcium oxide ( $\text{CaO}$ ) is solid state. Slaked lime is calcium hydroxide  $\text{Ca}(\text{OH})_2$  is solid state. Lime water is a dilute solution of calcium hydroxide, in water. Soda lime is a mixture of sodium hydroxide and calcium oxide ( $\text{NaOH} + \text{CaO}$ ).

6. (a) *Both (I) and (III)*

**Explanation:** Oxidation is the addition of oxygen to a substance or removal of hydrogen from a substance.

Reduction is the addition of hydrogen to a substance or removal of oxygen from a substance.

As  $\text{Fe}_2\text{O}_3$  loses Oxygen to form Fe, it is getting reduced whereas oxygen is added to CO and therefore it is oxidized.



7. (b) *displacement reaction*

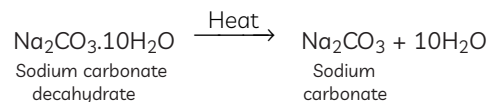
**Explanation:** Al Displaces Fe from compound  $\text{Fe}_2\text{O}_3$  to form  $\text{Al}_2\text{O}_3$ .

### 💡 Related Theory

Al is more reactive than Fe. Thus, Al displaces Fe from compound  $\text{Fe}_2\text{O}_3$  to form  $\text{Al}_2\text{O}_3$ .

8. (c) *It becomes anhydrous*

**Explanation:** On heating sodium carbonate decahydrate, water of crystallisation is lost and the substance becomes anhydrous.



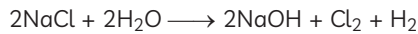


### Related Theory

The water of crystallisation is formed by purified crystals in an aqueous solution. These crystals do not include contaminants, but are easily affected by heat.

9. (c) Chlor for chlorine; alkali for sodium hydroxide

**Explanation:** It is because of the products formed : chlor for chlorine and alkali for sodium hydroxide.



10. (d) thermal decomposition reaction

**Explanation:** When mercury (II) oxide is heated strongly, it decomposes to give the elements mercury and oxygen.

11. (c) (II), (III), (IV) only

**Explanation:** Glucose  $\xrightarrow{\text{Cytoplasm}}$  Pyruvate  
 $\xrightarrow[\text{In yeast}]{\text{Absence of oxygen}}$  Ethanol + Carbon dioxide + Energy

12. (b) (I) – B; (II) – D; (III) – A; (IV) – C

**Explanation:** (I) is renal artery that carries blood to the kidneys for filtration.

(II) is renal vein that carries blood after filtration away from the kidneys.

(III) is the tubular part of nephron in which reabsorption of initial filtrate such as glucose, amino acids, salts and major amounts of water takes place.

(IV) is the collecting duct that collects the urine formed in the nephrons

13. (c) (I), (II) and (III)

**Explanation:** Organisms have different energy needs that depends upon the body design. Plants have low energy needs as they do not move and plant bodies have a large proportion of dead cells in many tissues. However, the distances over which transport systems have to operate can be very large in tall plants.

14. (c) Small intestines

**Explanation:** Bile is secreted by the liver and is stored in the gall bladder from where it enters the small intestine via a common duct. Bile juice from the liver makes the medium alkaline for the pancreatic enzymes to act. Fats are present in the intestine in the form of large globules which makes it difficult for enzymes to act on them. Bile salts break them down into smaller globules increasing the efficiency of enzyme action.

15. (a) Transport of water

**Explanation:** Xylem tissues include tracheids, vessels, fibres and parenchyma and serve in the ascent of sap or water and minerals.



### Related Theory

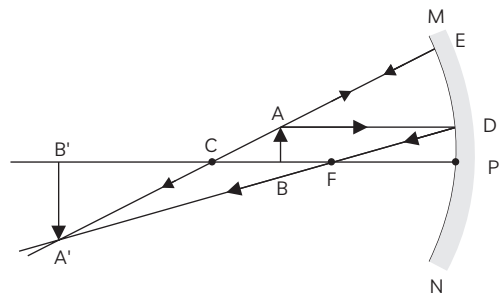
Phloem tissues comprises of four elements: sieve, companion cell, phloem fibres and phloem parenchyma. They serve in translocation of organic nutrients.

16. (a) No clotting of blood

**Explanation:** In the absence of platelets, the process of clotting will be affected.

17. (a) Concave Mirror

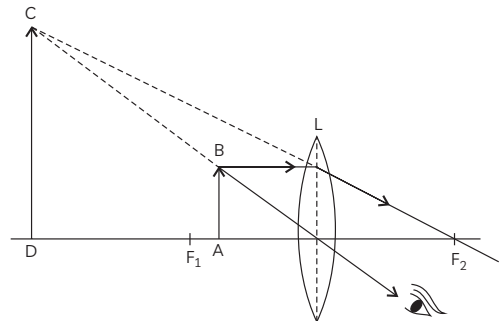
**Explanation :** Only a concave mirror forms a real and enlarged image of an object when it is placed between C and F as shown below:



A convex mirror always forms a virtual, erect and diminished image whereas a plane mirror always forms a virtual image of same size as the object.

18. (b) Position of image : Infront of lens;  
Nature of image : Virtual and erect;  
Magnification :  $M > +1$

**Explanation:** When an object is placed between the optical centre O and the principal focus  $F_1$  of a convex lens, it forms a virtual, erect and magnified image of the object in front of the lens. As image is virtual and magnified,  $m > +1$ .



19. (a)  $1.5 \times 10^8$  m/s

**Explanation:** If  $n_1$  and  $n_2$  are the refractive indices of the first and the second medium with respect to vacuum, and the speed of light in the first and second medium is  $v_1$  and  $v_2$  respectively, Snell's can be written as

$$n_{21} = \frac{\sin i}{\sin r} = \frac{v_1}{v_2} = \frac{(c/n_1)}{(c/n_2)} = \frac{n_2}{n_1}$$

Therefore, refractive index of the medium is  $\frac{3}{2}$

20. (b)  $-2.5 D$  : Power of combination,  $-40 \text{ cm}$   
: Focal length of combination, Concave :  
Nature of combination of lens.

**Explanation:** Power of convex lens is positive and that of concave lens is negative as per the sign convention as focal length of convex lens is taken as positive and that of concave lens is taken to be negative.

Let  $P_1$  and  $P_2$  be the power of convex lens and concave lens respectively.

Let  $f_1$  and  $f_2$  be the focal length of convex lens and concave lens respectively.

$$P_1 = +5 D; P_2 = -7.5 D$$

$$\Rightarrow f_1 = +\frac{1}{5} m; f_2 = -\frac{1}{7.5} m$$

$$\begin{aligned} P &= P_1 + P_2 \\ &= +5 - 7.5 \\ &= -2.5 D \end{aligned}$$

And focal length of the combination =

$$\begin{aligned} f &= \frac{1}{P} = \frac{1}{-2.5} m \\ &= -40 \text{ cm} \end{aligned}$$

As focal length of the combination of lenses is negative, it is a concave lens.

21. (c)  $+6.7 D$

**Explanation:** The value of  $\frac{1}{u} + \frac{1}{f}$  comes out to  $0.067 \text{ cm}^{-1}$ .

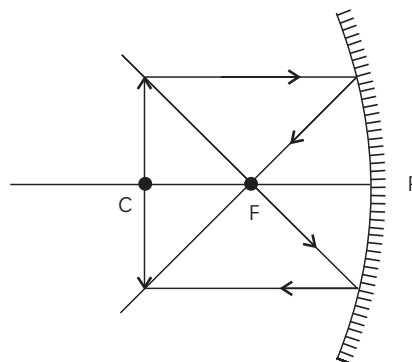
According to the lens formula,  $\frac{1}{f} = \frac{1}{u} + \frac{1}{v} = 0.067$

As power is the reciprocal of focal length (in m),  
 $P = +6.7 D$

22. (c) Position of image :  $-50 \text{ cm}$ ;  
Magnification :  $-1$

**Explanation:** It is given that the focal length of concave mirror is  $25.0 \text{ cm}$ . It means its focus (F) is at a distance of  $25.0 \text{ cm}$  and therefore its centre of curvature C will be at a distance of  $2f$  or  $50.0 \text{ cm}$  from the mirror.

This means that the object is placed at C. The image will also be formed at centre of curvature and of the same size as the object. Image formed will be real and inverted.



As magnification  $m$

$$= m = \frac{\text{size of image}}{\text{size of object}} = -1$$

23. (a) Not correct

**Explanation:** The statement observed by the student is incorrect because the student is stating the nature of colours in reverse order i.e. 3 represents the colour of gold metal (i.e. yellow) and 5 represents the colour of the sky (i.e., Blue).

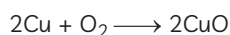
24. (c) All colours of white light move with the same speed

**Explanation:** All colours of light travel at the same speed in a vacuum.

## SECTION - B

25. (a)  $x = \text{Cu}$ ;  $y = \text{CuO}$ ; Substance Oxidized :  $\text{Cu}$ ;  
Substance Reduced :  $\text{Cu}$

**Explanation:** Metal X is copper, which has a shining brown colour. When it is heated, its surface becomes coated with black copper oxide,  $\text{CuO}$ .



When hydrogen gas is passed over heated copper oxide, reverse reaction takes place and copper is obtained.



Copper is oxidized to copper oxide by addition of oxygen whereas copper oxide is reduced to copper by removal of oxygen.

26. (b) Baking soda

**Explanation:** Baking soda solution is basic in nature and hence neutralises the excess acid present in the stomach.

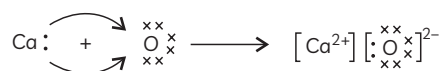
27. (d) No reaction occurs

**Explanation:** No change will take place and the silver spoon will remain unaffected because no chemical reaction takes place as silver is placed below copper in the activity series.

28. (a) Cation :  $[\text{Ca}^{2+}]$ ; Anion :  $[\text{O}^{2-}]$

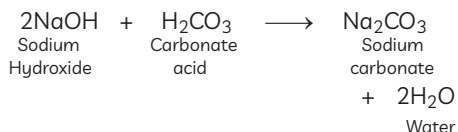
**Explanation:** The atomic number of calcium is 20 and electronic configuration is (2, 8, 8, 2). Atomic number of oxygen is 8 and electronic configuration is (2, 6).

So, two electrons will be transferred from the calcium atom to oxygen atom in order to attain their nearest inert gas configuration.



29. (d) Both (b) and (c)

**Explanation:** Sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) is the salt of weak acid carbonate acid ( $\text{H}_2\text{CO}_3$ ) and strong base sodium hydroxide ( $\text{NaOH}$ ).



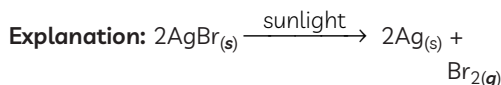
30. (b) Soil B

**Explanation:** Soil B is acidic. Hence it should be treated with powdered chalk to reduce its acidity.

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

**Explanation:** Ionization of an acid or a base increases with dilution but concentration of  $\text{H}^+$  or  $\text{OH}^+$  ions decreases per unit volume. Thus strength of the acid or the base decreases with dilution.

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



33. (d) A is false but R is true.

**Explanation:** Veins are the vessels which carry deoxygenated blood from various organs and bring it back to the heart. They do not need thick walls because the blood is no longer under pressure. They have valves that ensure that the blood flows only in one direction.

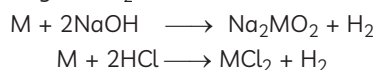
34. (c) A is true, but R is false.

**Explanation:** When the objects are observed through hot air, the objects appear to be moving slightly as the light refracts due to atmospheric refraction. This refraction occurs because hotter air is optically rarer than the cooler air above it and has a refractive index slightly less than that of the cooler air.

35. (a) by bringing matchstick near the reaction vessel

**Explanation:** The metal is a lustrous, divalent element, so it is a very reactive that can react with  $\text{NaOH}$  in the first case, a base reacts with a metal, and in the second case, an acid reacts with a metal.

Hence, hydrogen gas can be identified by bringing matchstick near the reaction vessel. The gas burn with a pop sound. This confirms that the gas is  $\text{H}_2$ .



36. (a) Part (A) : Trachea; Function : Cartilaginous tube that connects the mouth cavity to the larynx.

**Explanation:** Part labelled (A) is the trachea also called the windpipe, which is a cartilaginous tube that connects the larynx to the bronchi of the lungs, allowing the passage of air. The trachea extends from the larynx and branches into the two primary bronchi.

37. (d) (I), (III) and (IV)

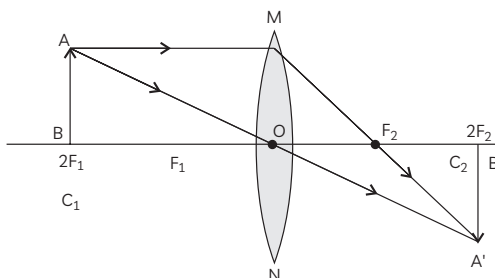
**Explanation:** The transport of soluble products of photosynthesis is called translocation and takes place through phloem.

38. (b) Test Tube A: No change in colour; Test Tube B: Colour changes to blue black;

**Explanation:** We will observe a colour change in test tube B, showing presence of starch. Where as test tube A will show no colour change as due to addition of saliva, starch is converted into sugar by the enzyme salivary amylase.

39. (b) 12 cm in front of the lens

**Explanation:** It is given that magnification of the lens is -1, which means that the image formed is real, inverted and of same size as the object. This happens when the object is placed at  $2F$  as shown in the ray diagram below:



Since  $f = 6$  cm, object should be placed at  $2f$  or 12 cm in front of the lens.

40. (d) Both (II) and (IV)

**Explanation:** Snell's law states that the ratio of sine of angle of incidence  $i$  to the sine of angle of refraction  $r$  is constant for a given pair of media. This can be written as:

$$\frac{\sin i}{\sin r} = \text{constant} = n_{21}, \text{ where } n_{21} \text{ is called the}$$

refractive index of medium 2 with respect to medium 1.

The value of the refractive index for a given pair of media depends upon the speed of light in the two media as it is given by the ratio of speed of light in the first medium to the speed of light in the second medium.

As the slope of the graph and hence the value of  $\frac{\sin i}{\sin r}$  is the greatest for Air or Diamond, we

can say that the speed of light is the least in diamond as  $n = \frac{c}{v} = \frac{\sin i}{\sin r}$

41. (c) Part of human heart : Right Atrium;  
characteristic function : Chamber where oxygenated blood from lungs is collected.

**Explanation:** The chamber where oxygenated blood from lungs is collected is the left atrium whereas the right atrium collects the deoxygenated blood from different body parts.

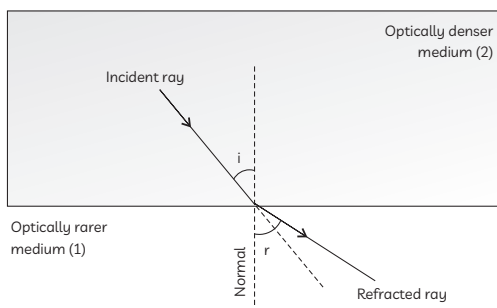
42. (c) Exchange of gases occurs only in leaves

**Explanation:** Exchange of gases occurs across the surface of stems, roots and also leaves.

43. (b) Both (I) and (III)

**Explanation:** As the speed of light in medium 1 > speed of light in medium 2, we can say that medium 1 is optically rarer medium compared to medium 2.

When light travels from an optically denser medium (2) to optically rarer medium (1), it will bend away from the normal as shown below:



Moreover, refractive index of medium 2 with respect to medium 1 =

$$n_{21} = \frac{v_1}{v_2} = \frac{2 \times 10^8}{1.5 \times 10^8} = 1.33$$

44. (a) Type of Mirror used : Concave mirror  
Magnification : -4

**Explanation:** As the student wants to obtain the image of the candle on a screen, the image will be real and inverted. Only a concave mirror produces a real and inverted image.

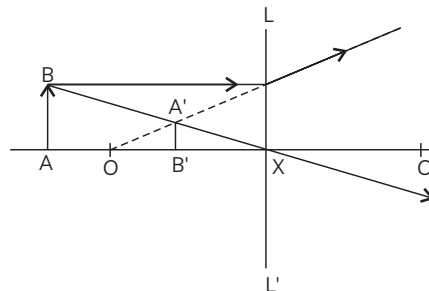
Here,  $u = -15$  cm and  $v = -60$  cm.

Magnification of a spherical mirror is given by

$$m = -\frac{v}{u} = -\frac{-60}{-15} = -4$$

45. (b) Type of Lens : Concave Lens  
Magnification : Virtual and erect

**Explanation:** It is observed that the ray of light diverges after refraction from the lens LL'. Therefore, the given lens is a concave lens. A concave lens always forms a virtual and erect image of objects placed in front of it as shown in the ray diagram below:



46. (a) Smaller than +1

**Explanation:** Magnification is defined as the ratio of size of image to the size of object. It is positive if image is virtual and erect and negative for real and inverted images.

As a convex mirror always forms a diminished image which is also virtual and erect,  $m < +1$ .

47. (a) 60 cm

**Explanation:** The focal length of the mirror is the distance between the pole of the mirror and the screen where the clear image of the distant object is formed. As the mirror stand is at 10 cm and screen is at 40 cm, therefore, focal length =  $40 - 10 = 30$  cm, as the image of a distant object is formed by a concave mirror at its focus. Radius of curvature =  $2f = 60$  cm.

48. (d) Both (II) and (IV)

**Explanation:** Metals such as silver and gold do not react with oxygen even at high temperatures as they are relatively inert.



### Related Theory

- ↳ Different metals show different reactivity's towards oxygen.
- ↳ At ordinary temperature, the surfaces of metals such as magnesium, aluminium, zinc, lead, etc., are covered with a thin layer of oxide, which prevents the metal from further oxidation and is therefore a protective layer.
- ↳ Iron does not burn on heating but iron filings burn vigorously when sprinkled in the flame of a burner.
- ↳ Copper does not burn, but the hot metal is coated with a black coloured layer of copper (II) oxide.

## SECTION - C

49. (a) (I), (II)

**Explanation:** The pH of B is highest. Thus, it is

a strongest base. It is used in antacids for e.g., milk of magnesia.

50. (d) *in cleaning of metals*

**Explanation:** Substance D is basic nature (pH-9.5). Hence, it can either be baking soda, or can be used as fire extinguisher or used in soaps and detergents. Usually strong acids are used in cleaning or metals (metals are basic in nature).

51. (d) *D*

**Explanation:** Substance D may be used in cakes to make them fluffy, e.g., baking soda. Substance B is a strong base, hence it is not used in baking.

52. (a) *Substance E can be used as preservative in pickles*

**Explanation:** Substance E is used as vinegar. Vinegar is used as preservative in foods.

53. (b) *Left Ventricle*

**Explanation:** The oxygenated blood from the lungs comes to the left atrium from where it is transferred to left ventricle which pumps it to different parts of the body.

54. (b) *Left Ventricle*

**Explanation:** As Left ventricle has to pump blood to different parts of the body, it has thick muscular walls.

55. (d) *(I), (III) and (IV)*

**Explanation:** The separation of the right side and the left side of the heart is useful to keep oxygenated and deoxygenated blood from mixing. Such separation allows a highly

efficient supply of oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals, which constantly use energy to maintain their body temperature.

56. (c) *Both (III) and (IV)*

**Explanation:** Arteries have thick, elastic walls as the pressure of blood in them is very high. As veins carry blood from different body parts to the heart, blood is no longer under pressure. Only veins have valves to prevent back flow of blood. Capillaries are the thinnest blood vessels.

57. (c) *Only (III)*

**Explanation:** Light of shorter wavelengths is scattered more as compared to light of longer wavelengths.

58. (d) *Black*

**Explanation:** Sky will appear to be black to an astronaut in space as there is no atmosphere at higher altitude scattering is not prominent there.

59. (c) *blue light is preferentially scattered.*

**Explanation:** Sky appears blue as light of shorter wavelengths (namely blue and violet) are scattered the most by the particles present in the atmosphere.

60. (b) *least scattered by fog or smoke*

**Explanation:** The danger signals are red in colour because it is least scattered by fog or smoke. Therefore, it can be seen in the same colour even at a distance.