

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

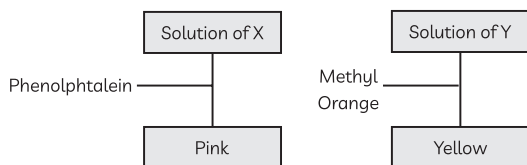
(Section A consists of 24 questions. Attempt any 20 questions from this section.

The first attempted 20 questions would be evaluated.)

- Which of the following changes are exothermic in nature?
 - Dissolution of ammonium chloride in water.
 - Decomposition of silver bromide.
 - Decomposition of ferrous sulphate.
 - Dilution of sulphuric acid.
- A dilute ferrous sulphate solution was added gradually to the beaker containing acidified potassium permanganate solution. The light purple colour of the solution fades and finally disappears. Select the correct statement.
 - Colour disappears due to dilution as no reaction is involved.
 - KMnO_4 is oxidising agent and oxidises FeSO_4 .
 - KMnO_4 decomposes in presence of FeSO_4 as KMnO_4 is less stable.
 - FeSO_4 acts as oxidising agent and oxidises KMnO_4 .
- Balance the following chemical equation:
$$\text{Pb}(\text{NO}_3)_2(\text{s}) \xrightarrow{\text{Heat}} \text{PbO}(\text{s}) + \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$$
 - $\text{Pb}(\text{NO}_3)_2(\text{s}) \rightarrow \text{PbO}(\text{s}) + \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
 - $\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO}(\text{s}) + \text{NO}_2(\text{g}) + 2\text{O}_2(\text{g})$
 - $2\text{Pb}(\text{NO}_3)_2 \rightarrow 5\text{PbO}(\text{s}) + 3\text{NO}_2(\text{g}) + 5\text{O}_2(\text{g})$
 - $\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO}(\text{s}) + \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
- Why does not a wall immediately acquire a white colour when a coating of slaked lime is applied on it?
 - slaked lime reacts with oxygen to form calcium carbonate, which imparts white colour
 - slaked lime reacts with carbon dioxide to form calcium hydroxide which imparts white colour
 - slaked lime reacts with carbon dioxide to form calcium carbonate which imparts white colour
 - slaked lime turns white on solidification
- The pH value of which of the salts will be greater than 7?
 - Sodium Carbonate
 - Sodium Chloride
 - Sodium Sulphate
 - Sodium Hydrogen Carbonate
 - Both (I) and (II)
 - Both (II) and (IV)
 - Both (I) and (III)
 - Both (I) and (IV)
- The process of dilution of acid or base with water will result in:
 - No change in the concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume

- (b) Decrease in the concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume
- (c) Increase in the concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume
- (d) Decrease in the concentration of H_3O^+ ions but increase in concentration of OH^- ions per unit volume

7. Solution of a substance X changes its colour to pink when Phenolphthalein is added to it. Solution of another substance Y changes its colour to yellow on adding methyl orange as shown in figure below:



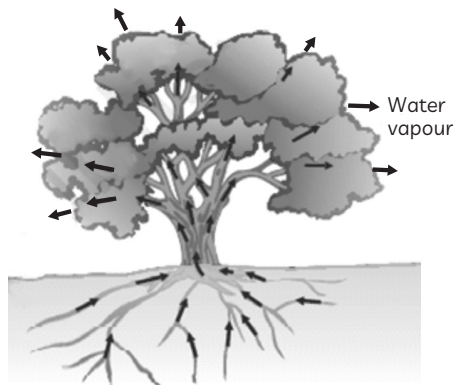
Identify the correct nature of solutions of X and Y:

- (a) Both X and Y are basic
 - (b) X is basic and Y is acidic
 - (c) X is acidic and Y is basic
 - (d) Both X and Y are acidic
8. Which is the strong acid?
 H_2CO_3 , HNO_3 , HCl , CH_3COOH
- (a) HNO_3 , H_2CO_3
 - (b) HNO_3 , HCl
 - (c) HCl , CH_3COOH
 - (d) H_2CO_3 , CH_3COOH
9. Why is sodium metal never left open in air?
- (a) It melts at room temperature
 - (b) It reacts with moisture present in air violently
 - (c) It reacts with oxygen present in air violently
 - (d) Both (b) and (c)
10. Study the given table:

Atom	Sub-atomic particles		
	Proton	Neutron	Electron
X	12	12	12
Y	7	8	7

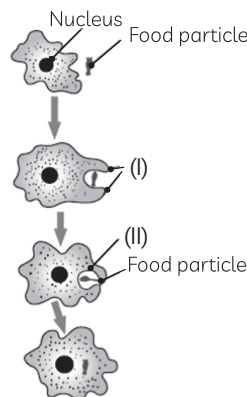
X and Y combine to form a compound of formula:

- (a) X_3Y_2
 - (b) X_2Y_3
 - (c) XY
 - (d) X_3Y
11. The figure below shows the movement of water in a tree.

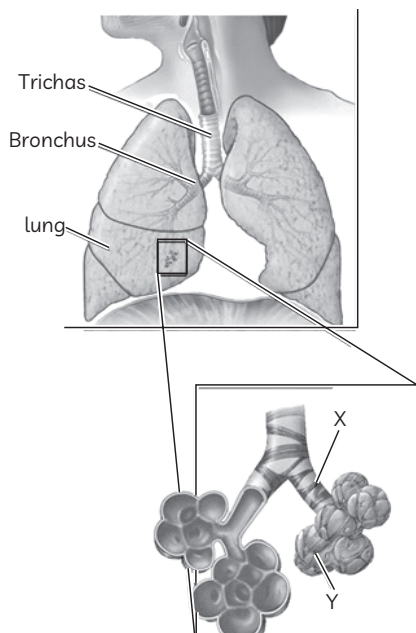


Based on the above figure, select the correct options:

- (I) The loss of water in the form of vapour from the aerial parts of the plant is known as transpiration.
 - (II) Evaporation of water molecules from the cells of a leaf creates a suction which pulls water from the phloem cells of roots.
 - (III) Transpiration helps in the absorption and upward movement of water and minerals dissolved in it from roots to the leaves.
 - (IV) Transpiration is the major driving force in the movement of water in the xylem during night.
- (a) Both (I) and (II)
 - (b) Both (II) and (III)
 - (c) Both (I) and (III)
 - (d) Both (III) and (IV)
12. Oxygen is transported by respiratory pigment as:
- (a) It is more soluble in water than CO_2
 - (b) Haemoglobin has high affinity for it.
 - (c) It easily diffuses to all body parts
 - (d) It is easily absorbed by our tissues.
13. Observe the diagram showing nutrition in Amoeba, where two parts have been labelled as (I) and (II), and select the correct option:



- (a) The part labelled (I) is the food vacuole and stores the food
 (b) The part labelled (I) is the pseudopodia and stores the food
 (c) The part labelled (II) is the food vacuole and digests the food
 (d) The part labelled (II) is the pseudopodia and digests the food.
- 14.** Which enzyme is secreted by the gastric glands?
 (a) Amylase (b) Pepsin
 (c) Trypsin (d) Lipase
- 15.** Which of the following is not a requisite of any respiratory surface to become highly efficient are:
 (a) Large surface area
 (b) Thick walls
 (c) Rich blood supply
 (d) Fine and delicate surface area
- 16.** A part of the human respiratory system has been shown separately in a box with two parts labelled as X and Y.

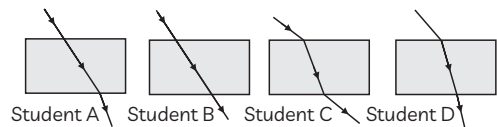


Identify the parts labelled X and Y from the table given below:

	X	Y
(a)	Bronchiole	Bronchi
(b)	Bronchiole	Alveoli
(c)	Bronchi	Alveoli
(d)	Alveoli	Bronchiole

- 17.** If a graph is plotted between $\sin r$ taken on X-axis and $\sin i$ taken on Y-axis, where i is the angle of incidence and r is the angle of refraction for a given pair of media, then:
 (I) Graph will be a parabola
 (II) Graph will be a straight line
 (III) Slope of graph will give the refractive index of the second medium with respect to the first
 (IV) Slope of graph will give the speed of light in the second medium.
 (a) Both (I) and (III)
 (b) Both (II) and (III)
 (c) Both (I) and (IV)
 (d) Both (II) and (IV)

- 18.** Four students plotted the path of light through a rectangular glass slab.

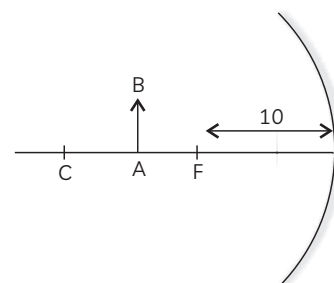


The correct ray diagram has been plotted by:

- (a) Student A (b) Student B
 (c) Student C (d) Student D
- 19.** A real image $\frac{1}{5}$ th the size of the object is formed at a distance of 18 cm from a lens. From the table select the row containing the correct identification of lens and focal length of the lens.

	Type of lens	Focal length
(a)	Concave	- 15 cm
(b)	Concave	- 90 cm
(c)	Convex	+ 30 cm
(d)	Convex	+ 15 cm

- 20.** Examine the figure given below and select the correct option regarding magnification m produced by the concave mirror for the position of object AB as shown:



- (a) $m > 1$ (b) $m < 1$
 (c) $m > -1$ (d) $m < -1$
21. Harsh wants to see a magnified image while shaving in a mirror. What type of mirror should use:
 (a) convex mirror
 (b) concave mirror
 (c) plane mirror
 (d) combination of (a) and (b)
22. If the image formed by a spherical mirror for all positions of the object placed in front of it always erect and diminished what type of mirror is it:
 (a) convex mirror
 (b) plane mirror
 (c) concave mirror
 (d) could be concave and convex
23. The time difference between actual sunset and the apparent sunset is about:
 (a) 2 min (b) 3 min
 (c) 4 min (d) 5 min
24. What is the colour of sunlight scattered by the dust particles in the atmosphere:
 (a) Blue (b) Red
 (c) White (d) Violet

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. Select the correct equation(s) which represent double displacement reaction?
 (I) $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$
 (II) $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
 (III) $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
 (IV) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
 (a) (I) and (IV) (b) (II) only
 (c) (I) and (II) (d) (III) and (IV)
26. Study the table below which shows different colour produced by universal indicator in A, B, C and D
- | Solution | Colour of universal indicator |
|----------|-------------------------------|
| P | Blue |
| Q | Green |
| R | Red |
| S | Violet |
- Which of them is strongly basic?
 (a) P (b) Q
 (c) R (d) S
27. An experiment was performed to test the electrical conductivity of some substances as shown in figure below:
-
28. The solution of which of the following will not conduct electricity?
 (a) Sodium Chloride
 (b) Magnesium Iodide
 (c) Alcohol
 (d) Calcium oxide
28. Following metals are taken and each of them was tested for its reaction with cold water, hot water and steam: Zn, Al, Cu, Fe, Mg, Na, K
 Select the correct observations:
 (I) Na and K react violently with cold water.
 (II) Mg does not react with cold water but reacts with hot water.
 (III) Al, Zn and Cu react with steam
 (IV) Fe does not react with water or steam at all.
 (a) Both (I) and (II)
 (b) Both (II) and (III)
 (c) Both (I) and (IV)
 (d) Both (III) and (IV)
29. When dilute hydrochloric acid is added to iron filling:
 (a) Hydrogen gas and iron chloride are formed
 (b) Chlorine gas and hydrogen gas evolved
 (c) Iron salt and water produced
 (d) No reaction takes place
30. If a person is stung by a bee, it causes burning pain and irritation.
 Application of which of the following on the stung area can give relief from the pain?
 (a) Vinegar (b) Orange juice
 (c) Baking soda (d) Tomato juice

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

Options:

- (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): When hydrogen and chlorine are placed in sunlight, hydrogen chloride is formed

Reason (R): It is an example of combustion reaction.

32. Assertion (A): Most reactive metals react with dilute acids to liberate hydrogen gas.

Reason (R): Very few reactive metals react with bases to liberate hydrogen gas.

33. Assertion (A): The light of violet colour deviates the most and the light of red colour the least, while passing through a prism.

Reason (R): The refractive index is highest for red light and lowest for the violet light.

34. Assertion (A): Focal length of a lens increases when its power decreases.

Reason (R): Power of a lens is inversely proportional to focal length.

35. Keeping food in air tight containers prevents rancidity of food as it:

- (a) Slows down decomposition of foods containing fats and oil.
- (b) Slows down oxidation of food containing fats and oil.
- (c) Slows down combustion of food containing fats and oil.
- (d) Slows down corrosion of foods containing fats and oil.

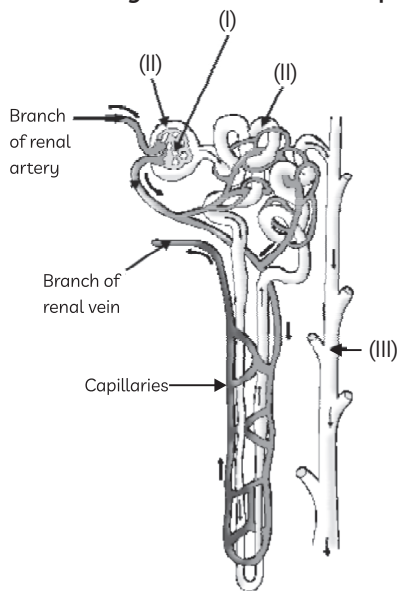
36. Study the table below and select the row that has the correct information:

	Break down of pyruvate in	Take place in	End products
(a)	Absence of oxygen	yeast	Lactic acid + Energy
(b)	Lack of oxygen	Muscle cells	Ethanol + CO ₂ + Energy
(c)	Presence of oxygen	Mitochondria	CO ₂ + H ₂ O + Energy
(d)	Presence of oxygen	Mitochondria	Ethanol - CO ₂ + Energy

37. The component of blood that helps in clotting of blood is:

- (a) Blood plasma
- (b) Red Blood Cells
- (c) White blood cells
- (d) Platelets

38. Observe the diagram of structure of nephron.



Match the labeling referred in column I and correlate with the function or structure in column II.

Column I	Column II
(I)	(a) Double walled cup shaped structure present at the upper end of the nephron.
(II)	(b) Selective reabsorption of glucose, amino acids, water, salt etc
(III)	(c) Bundle of blood capillaries present in the Bowman's capsule
(IV)	(d) Collects urine from the nephrons

- (a) (I) - (d); (II) - (b); (III) - (a); (IV) - (c)
- (b) (I) - (a); (II) - (c); (III) - (d); (IV) - (b)
- (c) (I) - (c); (II) - (d); (III) - (b); (IV) - (a)
- (d) (I) - (c); (II) - (a); (III) - (d); (IV) - (b)

39. What will be the minimum distance between an object and its real image formed by convex lens?

- (a) f
- (b) $>4f$
- (c) $2f$
- (d) $4f$

40. If the magnification of a lens has a negative value, then the image is:

- (a) smaller than object
- (b) same height as an object
- (c) larger than object
- (d) none of these

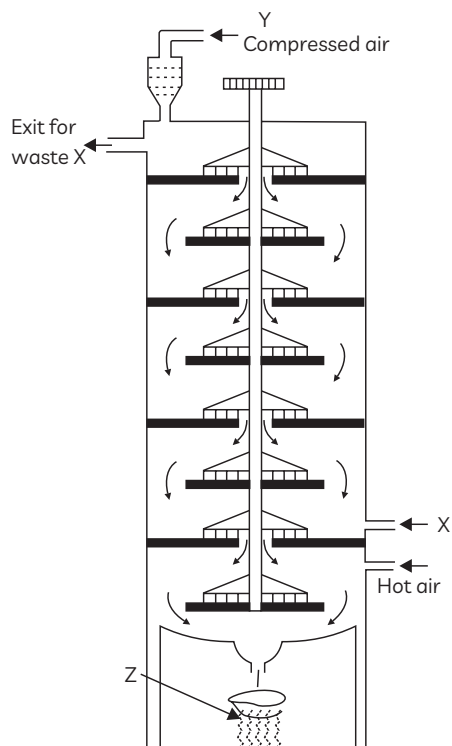
41. Select the correct statements :
- (I) Phloem transports soluble products of photosynthesis in plants.
 - (II) Xylem transports amino acids and other substances.
 - (III) Translocation of food and other substances takes place in sieve tubes.
 - (IV) Translocation in phloem is achieved by utilizing energy.
- (a) (I) and (II) (b) (II) and (III)
(c) (I), (II) and (III) (d) (I), (III) and (IV)
42. Which of the following event will not take place if the saliva lacks in salivary amylase?
- (a) Break down of starch to simple sugar
 - (b) Breakdown of proteins
 - (c) Break down of fats
 - (d) Creating an acidic medium
43. Focal length of a plane mirror is:
- (a) - 25 (b) infinite
 - (c) zero (d) 25 cm
44. The power of the lens is - 1.0 D. What is the nature of this lens?
- (a) Concave lens (b) Convex lens
 - (c) Both (d) Cannot be predicted
45. For a convex mirror, parallel rays of light appear to:
- (a) diverge (b) converge
 - (c) remains parallel (d) none of the above
46. A student tabulated the following information based on his studies of optical phenomena.

	Observation	Principle
(I)	Twinkling of stars	Scattering of light
(II)	Formation of rainbow	Dispersion of light
(III)	Early sunrise	Absorption of light
(IV)	Reddish colour of sun at sunrise and sunset	Atmospheric refraction

Select the row/s which contain correct observation:

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

47. Rajendra conducted an experiment using a concave mirror with a focal length of 30 cm. He places an object at a distance of 20 cm in front of the mirror. The image is formed
- (a) 20 cm in front of the mirror
 - (b) 10 cm in front of the mirror
 - (c) 30 cm behind the mirror
 - (d) 60 cm behind the mirror
48. A compound Z is manufactured by the action of a gas X, which is a product of Chlor alkali process, on a substance Y in a plant as shown:



Z is used as an oxidising agent in many chemical industries and also used for disinfecting drinking water.

Select the row containing the correct identification of X, Y and Z from the table below:

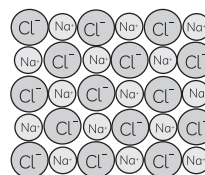
	X	Y	Z
(a)	Caustic soda	Chlorine gas	Washing soda
(b)	Dry slaked lime	Hydrogen gas	Bleaching powder
(c)	Chlorine gas	Dry slaked lime	Baking powder
(d)	Chlorine gas	Dry slaked lime	Bleaching powder

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: When an element composed of atoms that readily lose electrons (a metal) reacts with an element composed of atoms that readily gain electrons (a nonmetal), a transfer of electrons usually occurs, producing ions. The compound formed by this transfer is stabilized by the electrostatic attractions (ionic bonds) between the ions of opposite charge present in the compound. For example, when each sodium atom in a sample of sodium metal (group 1) gives up one electron to form a sodium cation, Na^+ , and each chlorine atom in a sample of chlorine gas (group 17) accepts one electron to form a chloride anion, Cl^- , the resulting compound, NaCl , is composed of sodium ions and chloride ions in the ratio of one Na^+ ion for each Cl^- ion.



Similarly, each calcium atom (group 2) can give up two electrons and transfer one to each of two chlorine atoms to form CaCl_2 , which is composed of Ca^{2+} and Cl^- ions in the ratio of one Ca^{2+} ion to two Cl^- ions. A compound that contains ions and is held together by ionic bonds is called an ionic compound. The periodic table can help us recognize many of the compounds that are ionic: ionic compounds are solids that typically melt at high temperatures and boil at even higher temperatures. The melting and boiling points of some common compounds is given below.

Melting and boiling points of common compounds

S.No.	Compound	Chemical formula	Melting point (K)	Boiling point (K)
(i)	Ethanol	$\text{C}_2\text{H}_5\text{OH}$	159	351
(ii)	Ammonia	NH_3	195.4	239.7
(iii)	Cesium bromide	CsBr	909	1573
(iv)	Magnesium oxide	MgO	3098	3873
(v)	Methane	CH_4	91	112
(vi)	Sodium chloride	NaCl	1074	1686
(vii)	Hydrogen	H_2	63	77
(viii)	Water	H_2O	273	373

49. Which of the compounds given in table above are ionic compounds?

- (I) Magnesium oxide
 - (II) Sodium chloride
 - (III) Ammonia
 - (IV) Cesium bromide
- (a) Both (I) and (II)
 (b) (I), (II) and (III)
 (c) (I), (II) and (IV)
 (d) Both (IV) and (III)

50. The atomic number of four elements P, Q, R, S are 10, 12, 14 and 16 respectively. The two elements which can react to form ionic compounds are:

- (a) P and S (b) Q and R
 (c) P and R (d) Q and S

51. Which of the following statement is true about ionic compounds?

- (I) Ionic compounds are crystalline solids.
 - (II) Ionic compounds are soluble in solvents such as kerosene and petrol.
 - (III) Ionic compounds conduct electricity when dissolved in water.
 - (IV) Ionic compounds conduct electricity in the molten state.
- (a) Both (I) and (II)
 (b) Both I and (III)
 (c) (I), (III) and (IV)
 (d) (I), (II) and (IV)

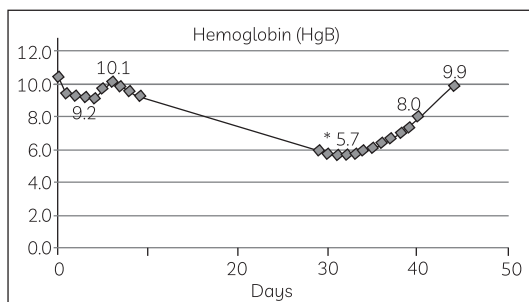
52. An element X having atomic number 13 forms a compound with element Y having atomic number 9. The cations and anions formed will be:

- (a) $3[X^+]$ and $[Y^{3-}]$
- (b) $[X^{3+}]$ and $3[Y^-]$
- (c) $3[X^+]$ and $3[Y^-]$
- (d) $[X^{3+}]$ and $[Y^{3-}]$

Q. 53-56 are based on Case Study-2.

Case 2: Haemoglobin (Hb) is a protein found in the red blood cells that carries oxygen in your body and gives blood its red colour. Haemoglobin levels vary from person to person. Men usually have higher levels than women. A haemoglobin “cut-off” level is set for blood donation to ensure that your haemoglobin will not drop below normal after you have donated blood. Normal ranges for haemoglobin differ between ethnic populations, males and females, and are also affected by age, especially in women. The haemoglobin level is expressed as the amount of haemoglobin in grams (g) per deciliter (dL) of whole blood, a deciliter being 100 milliliters.

53. The graph depicts a patient's haemoglobin levels over a 45 days period. Study the graph and answer the question below:



The condition the patient is suffering from caused due to a low level of haemoglobin is:

- (a) Asthma
- (b) Emphysema
- (c) Respiratory alkalosis
- (d) Anemia

54. The table below lists some parts of the human respiratory system. Select the row containing incorrect information.

	Part/organ of human respiratory system	Function
(a)	Trachea	cartilaginous tube that connects the mouth cavity to the larynx
(b)	Epiglottis	small cartilaginous flap of skin that covers the glottis while swallowing food
(c)	Alveoli	Provides surface where exchange of gases takes place
(d)	Larynx	enlarged part of trachea and is covered by pieces of cartilage

55. The normal ranges for Haemoglobin are:

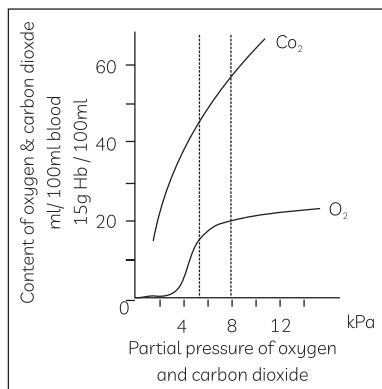
S. No.	Age Group	Haemoglobin count (gm/dl)
(1)	Normal haemoglobin levels in new-born babies	17-22
(2)	Normal haemoglobin levels in children	11-13
(3)	Normal haemoglobin levels in Adults (Male)	14-18
(4)	Normal haemoglobin levels in Adults (Female)	12-16
(5)	Normal haemoglobin levels in Elderly (Male)	12.4-14.9
(6)	Normal haemoglobin levels in Elderly (Female)	11.7-13.8

Which of the following helps our body to make haemoglobin?

- (a) Iron
- (b) Sodium
- (c) Calcium
- (d) Both (a) and (b)

56. Study the graph below that illustrates the difference between the content in blood of oxygen and carbon dioxide with change in partial pressure (partial pressure is the pressure of that constituent gas if it alone occupied the entire volume of the original mixture at the same temperature. Gases dissolve, diffuse, and react according to their partial pressures).

Now answer the question that follows:



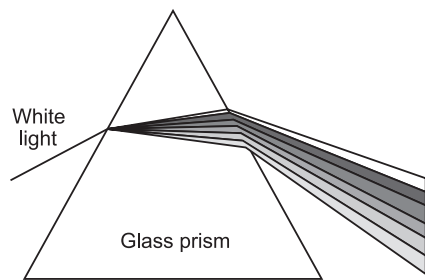
Carbon dioxide is transported in our body:

- (a) By haemoglobin
- (b) In dissolved form
- (c) By ATP
- (d) By alveoli

Q. 57-60 are based on Case Study-3.

Case 3: Dispersion of light occurs when white light is separated into its different constituent colors because of refraction and Snell's law. From Snell's law it can be seen that the angle of refraction of light in a prism depends on the refractive index of the prism material.

Colour	λ (nm)	Freq (Hz)
Red	760-647	4.3×10^{14}
Orange	647-585	4.3×10^{14}
Yellow	585-575	5.2×10^{14}
Green	575-491	5.6×10^{14}
Blue	491-424	6.6×10^{14}
Violet	424-380	7.3×10^{14}



Since the refractive index varies with wavelength, the angle that the light is refracted by will also vary with wavelength, causing an angular separation of the colors known as angular dispersion.

For visible light, refraction indices n of most transparent materials (e.g., air, glasses) decrease with increasing wavelength :

Colour	Wave-length (nm)	Crown glass	Flint glass
Violet	396.9	1.533	1.663
Blue	486.1	1.523	1.639
Yellow	589.3	1.517	1.627
Red	656.3	1.515	1.622

Most often seen in recently made puddles on the sides of roads, the oil refracts light much the same way a rainbow does. Simply put, the thin layer of oil floating on top of the water refracts the light which then bounces back up off the water underneath, splitting the light rays creating a pool of rainbow colours.

57. The ray which is least deviated by a prism is:

- (a) Violet ray
- (b) Green ray
- (c) Red ray
- (d) Yellow ray

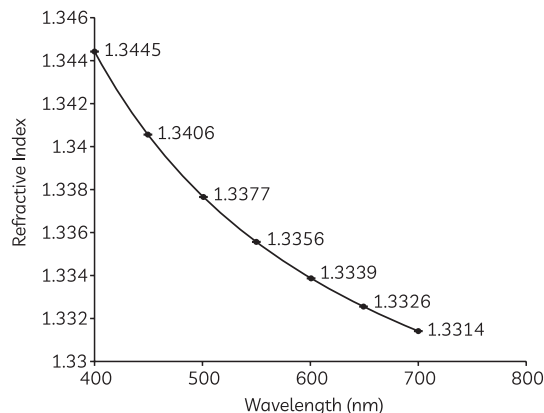
58. The colour of light which has the minimum velocity in the glass prism is:

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

59. The angle of deviation (Δ) of a prism is :

- (a) The angle between incident and refracted ray
- (b) The angle between the emergent and refracted ray
- (c) The angle between the incident and emergent ray
- (d) The angle between emergent ray and prism surface

60. A student plotted the following graph to observe how the refractive index of the material of a prism varies with the wavelength of different components of light.



Select the correct option showing the refractive index of the medium for colours of different wavelengths:

(a) $n(\lambda_{\text{blue}}) < n(\lambda_{\text{red}}) < n(\lambda_{\text{yellow}})$

(b) $n(\lambda_{\text{red}}) < n(\lambda_{\text{blue}}) < n(\lambda_{\text{yellow}})$

(c) $n(\lambda_{\text{red}}) < n(\lambda_{\text{yellow}}) < n(\lambda_{\text{blue}})$

(d) $n(\lambda_{\text{blue}}) < n(\lambda_{\text{yellow}}) < n(\lambda_{\text{red}})$



SOLUTION

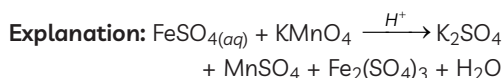
SAMPLE PAPER - 4

SECTION - A

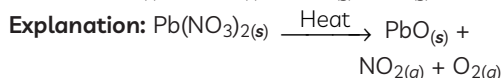
1. (d) Dilution of sulphuric acid.

Explanation: Reaction of acid or base with water is a highly exothermic reaction.

2. (b) KMnO_4 is oxidising agent and oxidises FeSO_4 .



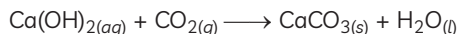
3. (a) $\text{Pb}(\text{NO}_3)_2(\text{s}) \rightarrow \text{PbO}(\text{s}) + \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$



4. (c) slaked lime reacts with carbon dioxide to form calcium carbonate which imparts white colour

Explanation: When a solution of slaked lime is applied on the wall, CO_2 gas present in air slowly reacts with thin layer of calcium hydroxide to form a thin layer of calcium carbonate, that is quite white.

Therefore, the newly formed calcium carbonate impart white look to the walls.



Related Theory

As it is produced by slaking quick lime (CaO) with water, that's why it is called slaked lime. It is used to reduce the acidity of lakes and soils.

5. (d) Both (I) and (IV)

Explanation: Sodium carbonate and sodium hydrogen carbonate are basic salts as they are formed from a strong base and a weak acid. Therefore, their pH values will be greater than 7. Sodium Chloride and Sodium Sulphate are neutral salts as they are formed from strong acid and strong base.

6. (a) Decrease in the concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume

Explanation: When an acid or a base is diluted by mixing it with water, there will be a decrease in the concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume.

7. (a) Both X and Y are basic

Explanation: Phenolphthalein is a synthetic indicator that changes colour of a basic solution to pink but remains colourless in acidic solution.

Methyl orange is another synthetic indicator that changes colour of solution to yellow in basic medium and red in acidic medium.

8. (b) HNO_3 , HCl

Explanation:

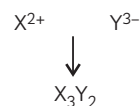
Strong acid	Weak acid
HNO_3	H_2CO_3
HCl	CH_3COOH

9. (c) It reacts with oxygen present in air violently

Explanation: Because sodium and potassium is very reactive metal and even combines explosively with air at room temperature and catches fire.

10. (a) X_3Y_2

Explanation:



11. (c) Both (I) and (III)

Explanation: Evaporation of water molecules from the cells of a leaf creates a suction which

pulls water from the xylem cells of roots. Transpiration is the major driving force in the movement of water in the xylem during day time.

12. (b) *Haemoglobin has high affinity for it.*

Explanation: The respiratory pigment haemoglobin has high affinity for oxygen and therefore oxygen is transported in our body by it. Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported in the dissolved form in our blood.

13. (c) *The part labelled II is the food vacuole and digests the food*

Explanation: Amoeba takes in food using temporary finger-like extensions of the cell surface which fuse over the food particle forming a food-vacuole. Inside the food vacuole, complex substances are broken down into simpler ones which then diffuse into the cytoplasm. The remaining undigested material is moved to the surface of the cell and thrown out.

14. (b) *Pepsin*

Explanation: The gastric glands present in the wall of the stoma release hydrochloric acid, a protein digesting enzyme called pepsin, and mucus.

15. (b) *Thick walls*

Explanation: The respiratory surface must have a large, fine and delicate surface area to get enough oxygen, thin walls for easy diffusion and exchange of respiratory gases and rich blood supply for transport of gases.

16. (b) *X : Bronchiole, Y : Alveoli*

Explanation: Within the lungs, the air passage divides into bronchioles which terminate in balloon like structures called alveoli, where exchange of gases takes place.

17. (b) *Both (II) and (III)*

Explanation: According to Snell's law, the ratio of $\frac{\sin i}{\sin r}$ for a given pair of media is a constant and is equal to the refractive index of the second medium with respect to the first.

18. (c) *Student C*

Explanation: The correct path of light has been plotted by student C. When light enters glass (a denser medium), it bends towards the normal. And when light emerges from the glass slab, it bends away from the normal. The emergent ray is parallel to the incident ray, but is laterally displaced.

19. (d) *Type of lens : Convex Focal length : +15 cm*

Explanation: It is given that the image formed by the lens is a real image which is $\frac{1}{5}$ times the size of the object. A real image is formed only by a convex lens as a concave lens always forms a virtual and erect image.

As image is real, $m = \frac{-1}{5}$ and $v = +18$ cm as a real image is always formed behind the lens. Let object distance = u

Using the formula,

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

$$\Rightarrow -\frac{1}{5} = \frac{18}{u}$$

$$\Rightarrow u = -90 \text{ cm}$$

To calculate the focal length of the lens, we use the lens formula,

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

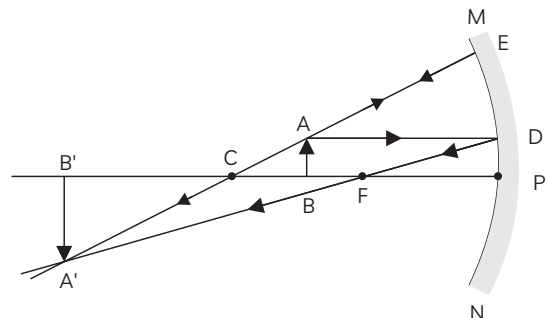
$$= \frac{1}{18} - \frac{1}{-90}$$

$$= \frac{1}{18} + \frac{1}{90} = \frac{6}{90}$$

$$f = 15 \text{ cm}$$

20. (c) *$m > -1$*

Explanation: The image formed will be real, inverted, enlarged and beyond C as shown below:

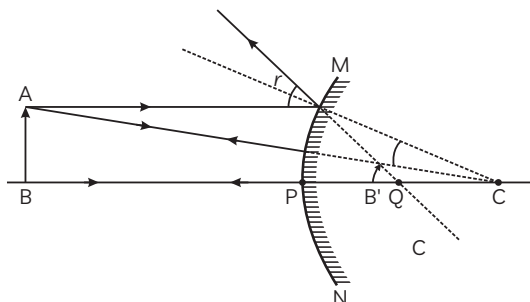


As size of image > size of object, but is real and inverted, therefore, $m > -1$

21. (b) concave mirror

Explanation: Harsh must use concave mirror to get a magnified image.

22. (a) convex mirror



Explanation: If the image formed by a spherical mirror is always erect and diminished then it is convex mirror.

23. (a) 2 min

Explanation: Due to atmospheric refraction, the sun is visible two minutes after actual sunset.

24. (c) White

Explanation: White colour of the sunlight is scattered by the dust particles in the atmosphere.



Caution

Blue colour of the sunlight is scattered by the air molecules in the atmosphere.

SECTION - B

25. (b) (II) only

Explanation: In double displacement reactions, one component each of both the reacting molecules is exchanged to form the products.

26. (d) S

Explanation: 'S' is strongly alkaline (basic).



Caution

Universal indicator turns purple when added to strong base, whereas litmus turns purple in neutral solution.

27. (c) Alcohol

Explanation: Ionic compounds conduct electricity in molten state or in solution as the ions are then free to move. As sodium chloride, magnesium iodide and calcium oxide are ionic compounds, they will conduct electricity in solution. But alcohol will not conduct electricity as it is not an ionic compound and does not dissociate into ions.

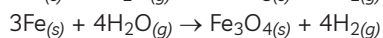
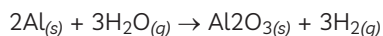
28. (a) Both (I) and (II)

Explanation: Metals like K and Na react violently with cold water.



Mg does not react with cold water but reacts with hot water to form $Mg(OH)_2$.

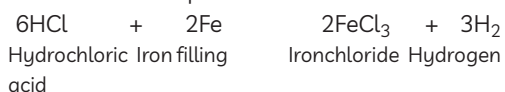
Metals like Al, Zn and Fe react with steam to form a metal oxide.



Metals like Pb, Cu, Ag and Au do not react with water at all.

29. (a) Hydrogen gas and iron chloride are produced

Explanation: When dilute hydrochloric acid is added to iron filling then hydrogen gas and iron chloride are produced.

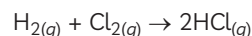


30. (c) Baking soda

Explanation: Bee-sting leaves an acid which causes pain and irritation. Therefore, applying a mild base like baking soda on the stung area gives relief. As vinegar, orange juice and tomato juice contain acid, they will not be helpful in the given situation.

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

Explanation: Hydrogen and chlorine combine to give hydrogen chloride which is a combination reaction.



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

Explanation: Most reactive metals are placed above the hydrogen in activity series.

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

Explanation: The light of violet colour deviates most and the light of red colour least, while passing through a prism. For a prism material refractive index is highest for violet light and lowest for the red light.

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

Explanation: Power P of lens is equal to reciprocal of the length f, i.e. $P = \frac{1}{f(\text{in metre})}$

Thus when focal length of lens increases, then its power decreases.

35. (b) *Slows down oxidation of food containing fats and oil.*

Explanation: When food is kept in air tight containers, it slows down the oxidation of foods containing fats and oil and therefore prevents rancidity of food.



Related Theory

- ↳ Rancidity can be prevented by adding anti-oxidants to foods containing fats and oils,
- ↳ Keeping food in air tight containers,
- ↳ By packaging fat and oil containing foods in nitrogen gas,
- ↳ By keeping food in a refrigerator and
- ↳ By storing foods away from light.

36. (c) *Break down of pyruvate in: Lack of oxygen; Take place in: yeast; End products $CO_2 + H_2O + Energy$*

Explanation: Breakdown of pyruvate using oxygen takes place in the mitochondria. This process breaks up the three-carbon pyruvate molecule to give three molecules of carbon dioxide. The other product is water.

37. (d) *Platelets*

Explanation: The blood has platelet cells which circulate around the body and plug the leakages due to any injury. These cells help to clot the blood at the points of injury.

38. (d) (I) – (c); (II) – (a); (III) – (d); (IV) – (b)

Explanation: The parts marked (I), (II), (III) and (IV) are:

- (I) **Glomerulus:** These are a bundle of blood capillaries present in the Bowman's capsule. One end of the glomerulus is attached to the renal artery (it brings dirty blood containing wastes into the kidney) and the other end is attached to the renal vein (it carries away the cleansed blood from the kidney). The function of glomerulus is to filter the blood passing through it.
- (II) **Bowman's Capsule:** It is a double walled cup shaped structure present at the upper end of the nephron.
- (III) **Collecting duct:** The last part of a long, twisting tube that collects urine from the nephrons (cellular structures in the kidney that filter blood and form urine) and moves it into the renal pelvis and ureters.
- (IV) **Tubular part of Nephron:** Selective reabsorption of glucose, amino acids, large amount of water and salts etc.

39. (d) *4f*

Explanation: The minimum distance is $4f$. i.e. when an object is placed at one of the two centres of curvature, and the image is formed at the other centre of curvature, the the image will be real.

40. (a) *smaller than the object*

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

Where h' = height of image
 h = height of object

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

Explanation : Statement II is incorrect as the transport of amino acids and other substances is done by phloem.

42. (a) *Break down of starch to simple sugar*

Explanation: Saliva contains salivary amylase which breaks down starch into simple sugar.

43. (b) *infinite*

Explanation: Focal length of a plane mirror is infinite as the radius of curvature is infinite.



Related Theory

- ↳ Focal length does not change w.r.t surrounding medium.

44. (a) *concave lens*

Explanation: Negative power is associated with concave lens and convex mirror.

45. (a) *diverge*

Explanation: Convex mirror is a diverging mirror while concave mirror is a converging mirror.

46. (b) *Only (II)*

Explanation: Formation of rainbow is due to dispersion of sunlight by the tiny droplets of water present in the atmosphere. Twinkling of stars and early sunrise are due to atmospheric refraction whereas reddish colour of sun at sunrise and sunset is due to the scattering of light.

47. (d) *60 cm behind the mirror*

Explanation: Here $f = -30$ cm $a = -20$ cm

$$\text{Using } \frac{1}{v} + \frac{1}{8} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{20} = -\frac{1}{30} \Rightarrow \frac{1}{v}$$

$$= -\frac{1}{30} + \frac{1}{20}$$

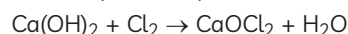
$$\frac{1}{v} = \frac{1}{60} \Rightarrow v = 60 \text{ cm}$$

Positive sign shows that image is formed behind the mirror.

48. (d) X : Chlorine gas; Y : Dry slaked lime;
Z : Bleaching powder

Explanation: The substance Z is Bleaching powder, CaOCl_2 .

The chlorine produced during the electrolysis of aqueous sodium chloride (brine) is used for the manufacture of bleaching powder. Bleaching powder is produced by the action of chlorine on dry slaked lime $[\text{Ca}(\text{OH})_2]$. Bleaching powder is represented as CaOCl_2 , though the actual composition is quite complex.



SECTION - C

49. (c) (I), (II) and (IV)

Explanation: As the melting and boiling points of ionic compounds is very high, we can conclude from the given table that the compounds Magnesium oxide, Sodium chloride and Cesium bromide are ionic compounds.



Related Theory

- An ionic bond is formed when a metal reacts with a non-metal and transfer of electrons takes place from metal atoms to non-metal atoms.
- The metal atom develops a positive charge after donating electrons and thus becomes a cation. The non-metal atom becomes a negatively charged ion, anion, after gaining or accepting electrons.
- They have high melting and boiling points as a large amount of energy is required to break the strong inter-ionic attraction between the oppositely charged ions.

50. (d) Q and S

Explanation: The electronic configuration of the given elements is given below:

P : 2, 8

Q : 2, 8, 2

R : 2, 8, 4

S : 2, 8, 6

Q is a metal (as it has 2 valence electrons) and S is a non-metal (having 6 valence electrons), they can react to form an ionic compound.



Related Theory

- The formula of the compound formed by the transfer of electrons from Q to S will be QS.
- $$Q \quad Q^{2+} + 2e^{-}$$
- $$S + 2e^{-} \quad S^{2-}$$

51. (c) (I), (III) and (IV)

Explanation: Ionic compounds are generally crystalline solids and hard due to the strong force of attraction between the positive and

negative ions. They are generally brittle.

These conduct electricity when dissolved in water as its solution in water contains ions.

These conduct electricity in the molten state as the electrostatic forces of attraction between the oppositely charged ions are overcome due to the heat.

However, these do not conduct electricity in the solid state due to their rigid structure.

Ionic compounds are soluble in polar solvents such as water and insoluble in solvents such as kerosene, petrol etc.

52. (b) $[X^{3+}]$ and $3[Y^{-}]$

Explanation: The electronic configuration of X and Y will be:

X : 2, 8, 3

Y : 2, 7

The compound formed between X and Y will be an ionic compound as transfer of electrons will take place from X (being a metal) to Y (being a non-metal).

The formula of compound formed will be XY_3 .

The ions formed will be:

$$X \quad X^{3+} + 3e^{-}$$

$$3Y + 3e^{-} \quad 3[Y^{-}]$$

So, the cation formed will be $[X^{3+}]$ and anion formed will be $3[Y^{-}]$

53. (d) Anemia

Explanation: A low haemoglobin level is referred to as anemia or low red blood count and haemoglobin levels reflect this number.



Related Theory

- Asthma is a condition in which a person's airways become inflamed, narrow and swell and produce extra mucus, which makes it difficult to breathe.

- Emphysema is a lung condition that causes shortness of breath. In people with emphysema, the air sacs in the lungs (alveoli) are damaged. Over time, the inner walls of the air sacs weaken and rupture — creating larger air spaces instead of many small ones.
- The cause of emphysema is usually long-term exposure to irritants that damage your lungs and the airways.
- Respiratory alkalosis is a condition marked by a low level of carbon dioxide in the blood due to breathing excessively. Respiratory alkalosis occurs when the blood pH level is out of balance.

54. (a) Part/organ of human respiratory system — Trachea

Function—cartilaginous tube that connects the mouth cavity to the larynx

Explanation: The incorrect statement is (a) as the trachea, also called the windpipe, is a cartilaginous tube that connects the larynx to the bronchi of the lungs, allowing the passage of air, and so is present in almost all air-breathing animals with lungs. The trachea extends from the larynx and branches into the two primary bronchi.

55. (a) Iron

Explanation: Iron is an important component of haemoglobin which is present in red blood cells. It carries oxygen from lungs to different parts of the body. Iron deficiency can lead to anaemia, that is a low count of haemoglobin as there is insufficient iron in the body to produce enough of haemoglobin.

56. (b) In dissolved form

Explanation: Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported in the dissolved form in our blood.



Related Theory

- When the body size of animals is large, the diffusion pressure alone cannot take care of oxygen delivery to all parts of the body.
- Instead, respiratory pigments take up oxygen from the air in the lungs and carry it to tissues which are deficient in oxygen before releasing it.
- In human beings, the respiratory pigment is haemoglobin which has a very high affinity for

oxygen. This pigment is present in the red blood corpuscles.

- The energy released during cellular respiration is immediately used to synthesise a molecule called ATP which is used to fuel all other activities in the cell.
- Within the lungs, the passage divides into smaller and smaller tubes which finally terminate in balloon-like structures which are called alveoli.
- The alveoli provide a surface where the exchange of gases can take place. The walls of the alveoli contain an extensive network of blood-vessels.

57. (c) Red ray

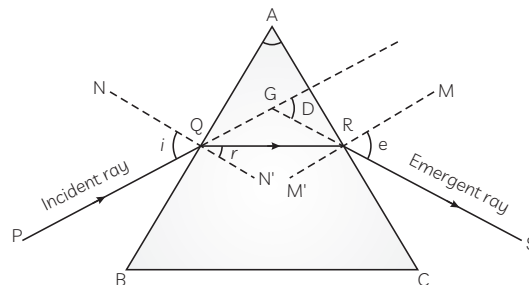
Explanation: Red colour is least deviated by a prism as the refractive index of glass is least for red.

58. (d) Violet

Explanation: Violet has the least wavelength among the colours of the visible spectrum. It has the minimum velocity.

59. (c) The angle between the incident and emergent ray.

Explanation: The angle between the emergent ray and the incident ray is known as the angle of deviation of a prism as shown in the following figure:



60. (c) $n(\lambda_{red}) < n(\lambda_{yellow}) < n(\lambda_{blue})$

Explanation: As can be seen from the graph, the refractive index of the material of the prism decreases with increase in wavelength.

Since wavelength of red colour > yellow > blue, the refractive index of the material will vary inversely with the wavelength.

