

TERM-1

SAMPLE PAPER

SOLVED

SCIENCE

Time Allowed: 90 Minutes

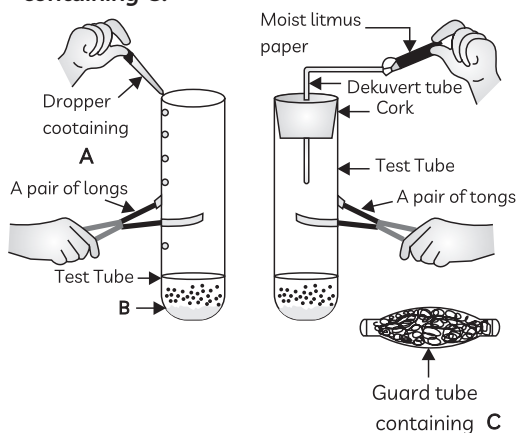
Maximum Marks: 40

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 is not a chemical change?
 - Getting salt from sea water
 - Ripening of fruits and vegetables
 - Formation of curd from milk
 - Burning of coal
- Hydrogen chloride gas is prepared by the reaction between substances labelled A and B in the figure below. On a humid day, the gas is usually passed through a guard tube containing C.



Identify the substances A, B and C and select the row containing the correct labelling of the substances A, B and C.

	A	B	C
(a)	H ₂ SO ₄	NaCl	CaCl ₂
(b)	H ₂ SO ₄	Na ₂ CO ₃	CaCl ₂
(c)	NaHCO ₃	NaCl	KOH
(d)	Na ₂ CO ₃	H ₂ SO ₄	KOH

- An element X having atomic number 13 forms a compound with element Y having atomic number 9. The cations and anions formed will be:
 - 3[X⁺] and [Y³⁻]
 - [X³⁺] and 3[Y⁻]
 - 3[X⁺] and 3[Y⁻]
 - [X³⁺] and [Y³⁻]
- The table below lists some metals in column I and the colour of coating or powder on their surface due to corrosion on them in column II.

Column I	Column I
(I) Iron	(A) White
(II) Aluminium	(B) Green
(III) Copper	(C) Black
(IV) Silver	(D) Reddish brown

Match the metals given in column I with the correct change mentioned in column II:

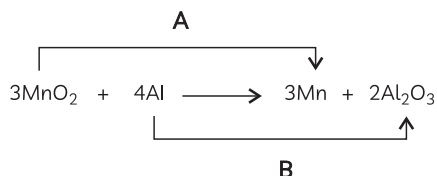
- (a) (I) - (D); (II) - (C); (III) - (B); (IV) - (A)

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

5. Baking soda is:

- (a) sodium hydrogen carbonate
 (b) sodium hydroxide
 (c) sodium carbonate decahydrate
 (d) calcium oxychloride

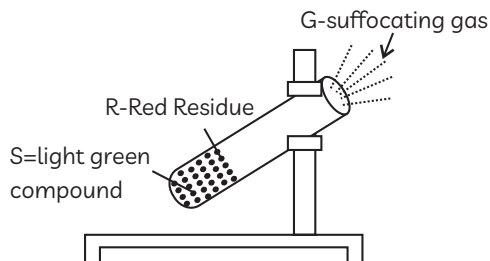
6. Study the figure below showing the reaction between Manganese dioxide and aluminium.



Select the row containing the correct process marked A and B and substances undergoing the change from the table below:

	A	B	Substance oxidized	Substance reduced
(a)	Oxidation	Reduction	MnO ₂	Mn
(b)	Oxidation	Reduction	Al	Al ₂ O ₃
(c)	Reduction	Oxidation	Al	MnO ₂
(d)	Reduction	Oxidation	MnO ₂	Al

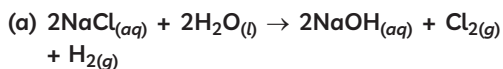
7. Two gases 'G' having suffocating odour are obtained when a green solid 'S' is heated, along with a residue 'R'. These gases are major air pollutants. When the vapours of the gases are collected and dissolved in water, the solution turns blue litmus to red. The colour of the residue becomes red.



What would be S, R, G.

- (a) Pb[NO₃]₂, PbO₂, NO₂, N₂O₄
 (b) FeSO₄, Fe₂O₃, H₂O, H₂O₂
 (c) FeSO₄, Fe₂O₃, SO₂, SO₃
 (d) PbSO₄, Pb₂O₂, SO₂, SO₃

8. Which of the following equation represent chlor-alkali process?



- (b) $2\text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{NaOH}_{(aq)} + \text{Cl}_{2(g)} + \text{H}_{2(g)}$
 (c) $\text{NaCl}_{(aq)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + \text{Cl}_{2(g)} + 2\text{H}_{2(g)}$
 (d) $\text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{NaOH}_{(aq)} + \text{Cl}_{2(g)} + \text{H}_{2(g)}$

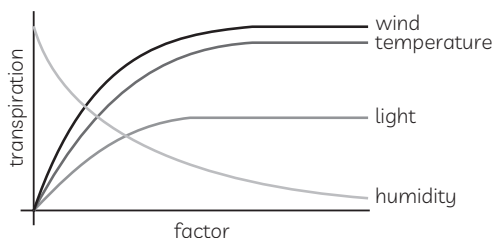
9. When a few drops of phenolphthalein is added to a solution having pH 10.5, then the colour:

- (a) changes to blue
 (b) changes to pink
 (c) changes to red
 (d) does not change

10. Photosynthesis is considered an:

- (a) Endothermic Reaction
 (b) Exothermic Reaction
 (c) Physical Reaction
 (d) Endothermic and Physical Reaction

11. A plot of various abiotic factors affecting the rate of transpiration is given below :



After analyzing the graph a student writes the following statements.

- (I) The rate of transpiration increases with increase in light intensity, wind speed and humidity.
 (II) The rate of transpiration decreases linearly with increase in light intensity, temperature and humidity.
 (III) The rate of transpiration decreases with increase in humidity.
 (IV) The rate of transpiration increases with increase in light intensity, temperature and humidity.

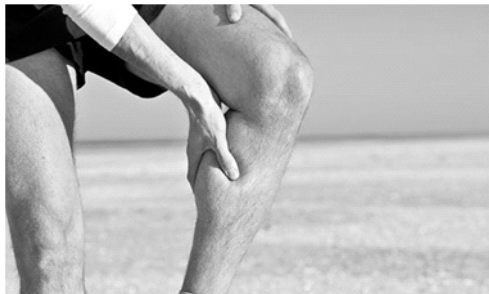
Choose from the following which of the following would be the correct statement(s).

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

12. Which part of alimentary canal receives bile from the liver?

- (a) Stomach (b) Small intestine
 (c) Large intestine (d) Oesophagus

13. A man developed sudden muscle cramps while jogging.



The reason for muscle cramps could be:

- (a) Build up of alcohol in muscles
 - (b) Build up of lactic acid in muscles
 - (c) Lack of water in the body
 - (d) Build up of carbon dioxide in muscles
- 14.** Select the incorrect statements about lymph:
- (I) It is also called tissue fluid
 - (II) It is similar to RBC of blood
 - (III) It drains into blood capillaries
 - (IV) It carries digested and absorbed fat from intestines
- (a) Both (II) and (IV)
 - (b) Both (I) and (IV)
 - (c) Both (I) and (III)
 - (d) Both (II) and (III)
- 15.** Which of the following are true about breathing?
- (I) The diaphragm and muscles attached to ribs relax during inhalation.
 - (II) The thorax moves upwards and outwards during inhalation, thereby decreasing the volume inside thoracic cavity.
 - (III) During exhalation, the muscles of diaphragm and ribs relax.
 - (IV) The thoracic cavity contracts and comes back to its original size during exhalation.
- (a) Both (I) and (III)
 - (b) Both (II) and (III)
 - (c) Both (I) and (IV)
 - (d) Both (III) and (IV)
- 16.** The transport of soluble products of photosynthesis is called:
- (a) Transpiration
 - (b) Exhalation
 - (c) Translocation
 - (d) Nutrition
- 17.** Select the correct statements:
- (I) The centre of curvature C of a spherical mirror is a part of the mirror.
 - (II) The centre of curvature of a concave mirror lies in front of it.
 - (III) The centre of curvature of a concave mirror lies behind the mirror.

(IV) The centre of curvature of a convex mirror lies behind the mirror.

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

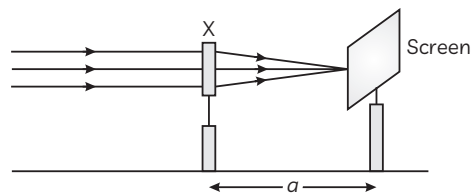
- 18.** The table below gives the refractive index of a few materials and the speed of light in that medium.

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

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

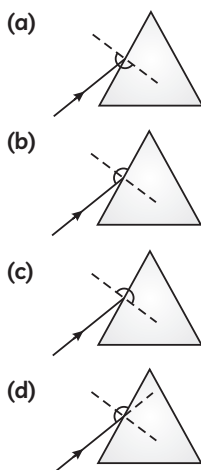
- (a) 1.5×10^8 m/s
- (b) 2.0×10^8 m/s
- (c) 3.0×10^8 m/s
- (d) 6.0×10^8 m/s

- 19.** Deeksha determined the focal length of a glass piece X by focusing a distant object on the screen as shown in the following diagram.



Which of the following statement is correct?

- (a) Device X is a concave mirror and distance d is its focal length.
 - (b) Device X is a concave mirror and distance d is its radius of curvature.
 - (c) Device X is a convex lens and distance d is its radius of curvature.
 - (d) Device X is a convex lens and distance d is its focal length.
- 20.** A pole of height 1.8 m stands in front of a larger vertical plane mirror. The distance of the image from the pole at a distance of 1.5 m from the mirror is:
- (a) 1.8 m
 - (b) 1.5 m
 - (c) 1.2 m
 - (d) 3.0 m
- 21.** Which of the following is the correct set-up of protractor for tracing the path of ray of light through a glass prism, for measuring the angle of incidence?



22. Aarav viewed his enlarged image in front of a mirror. He asked his father what kind of mirror that is. The father replied it was a concave mirror. What could be possible

position of Aarav to view such image in the mirror?

- (a) between f and $2f$
 (b) beyond $2f$
 (c) at $2f$
 (d) between f and P

23. The air layer of atmosphere whose temperature is less than the hot layer behave as optically:

- (a) denser medium
 (b) rarer medium
 (c) inactive medium
 (d) either denser or rarer medium

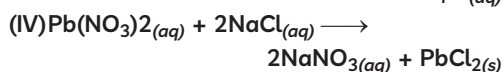
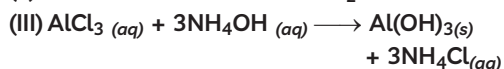
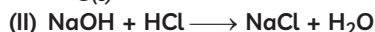
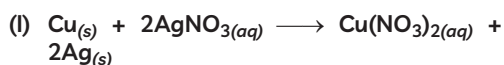
24. The danger signals are red in colour because it is:

- (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

SECTION - B

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

25. Which of the following reactions given below are not examples of double displacement reactions?



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

26. The table provides the pH value of four solutions P, Q, R and S

Solution	pH value
P	2
Q	9
R	5
S	11

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

- (a) $P > Q > R > S$
 (b) $P > S > Q > R$
 (c) $S < Q < R < P$
 (d) $S < P < Q < R$

27. 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)

28. Select the correct observations when calcium is treated with water:

- (I) Ca reacts with cold water
 (II) Ca reacts with hot water
 (III) Ca does not react either with cold water or with hot water.
 (IV) Ca starts floating as the bubbles of hydrogen gas stick to its surface.

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

29. Select the correct statements regarding metal oxides:

- (I) Metal oxides are basic in nature
 (II) Metal oxides are acidic in nature
 (III) Metal oxides react with acid to form salt and water.
 (IV) Metal oxides react with base to form salt and water.

- (a) Both (I) and (III)

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

30. Which of the following statement do not correctly represent the use of sodium hydroxide?
- (a) It is used in paper making
 - (b) It is used to rayon and acetate fibers
 - (c) it is used in killing bacteria in drinking wastes and in swimming pool
 - (d) It is used in detergents and soaps to remove greases.

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): Ammonium chloride is an acidic salt.

Reason (R): It is a salt of weak base $[NH_4Cl]$ and strong acid $[HCl]$

32. Assertion (A): The following chemical equation, $C_6H_6 + \frac{15}{2} O_2 \rightarrow 6CO_2 + 3H_2O$ is a balanced chemical equation.

Reason (R): In a balanced chemical equation, the total number of molecules is equal on both side of the equation.

33. Assertion (A): Each lung contain a residual volume of air.

Reason (R): It provide sufficient time for oxygen to be absorbed and carbon dioxide to be released.

34. Assertion (A) : The sky looks blue during day.

Reason (R) : No atmosphere containing air in the outer space to scatter sunlight.

35. Which of the following metals will not produce hydrogen gas with dilute HCl?

- (a) Mg
- (b) Cu
- (c) Al
- (d) Zn

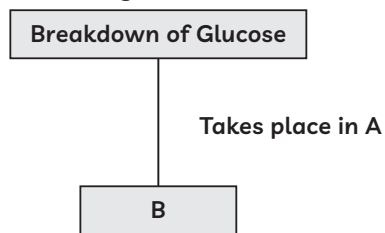
36. The event that does not occur in photosynthesis

- (a) Absorption of light energy by chlorophyll
- (b) Conversion of light energy to chemical energy
- (c) Splitting of water molecules into hydrogen and oxygen
- (d) Oxidation of carbon to carbon dioxide

37. The direction of diffusion of carbon dioxide and oxygen gases in plants depends on:

- (I) Environmental conditions
- (II) Plant requirements
- (III) Rate of transpiration
- (IV) Amount of ATP available
- (a) Both (I) and (II)
- (b) Both (II) and (III)
- (c) Both (I) and (IV)
- (d) Both (II) and (IV)

38. The figure below shows the first step in the breakdown of glucose.



Identify A and B and select the correct combination from the table below:

Option	A	B
(a)	Cytoplasm	Pyruvate
(b)	Cytoplasm	ATP
(c)	Mitochondria	Pyruvate
(d)	Mitochondria	ATP

39. The following table shows the absolute refractive index of some material medium.

Material Medium	Refractive index
Air	1.0003
Alcohol	1.36
Benzene	1.50
Rock Salt	1.54
Ruby	1.71

When light passes from benzene to alcohol:

- (a) It will bend towards normal
- (b) It will bend away from normal
- (c) It will go without any deviation
- (d) It will be reflected internally

S. No.	Object-Distance u (cm)	Image-Distance v (cm)
1.	-60	+12
2.	-30	+15
3.	-20	+20
4.	-15	+30
5.	-12	+60
6.	-9	+90

40. The focal length of the convex lens is:
 (a) + 10 cm (b) + 20 cm
 (c) - 10 cm (d) - 20 cm
41. The separation of the left and right side of the heart is useful in:
 (a) Preventing oxygenated and deoxygenated blood from mixing
 (b) Pumping blood to different body parts efficiently
 (c) Exchange of gases
 (d) Ensuring that blood flows in one direction only
42. The blood vessel that collects the blood from different organs and brings it back to the heart is:
 (a) Arteries (b) Veins
 (c) Capillaries (d) Lymph
43. A student uses a lens of focal length 40 cm and another of - 20 cm. The power and focal length of the combination will be:

	Power of Combination	Focal length of Combination
(a)	- 2.5 D	- 40 cm
(b)	+ 2.5 D	+ 40 cm
(c)	+ 5.0 D	+ 20 cm

(d)	- 5.0 D	- 40 cm
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44. If an object is placed perpendicular to the principal axis of a convex lens of focal length 8 cm and object distance is 12 cm, the image will be formed at?
 (a) 12 cm behind the lens
 (b) 12 cm in front of the lens
 (c) 24 cm behind the lens
 (d) 24 cm in front of the lens
45. The colour of the scattered light depends on:
 (a) Size of the scatterer
 (b) Total internal reflection
 (c) Dispersion of light
 (d) Atmospheric refraction
46. The apparent flattening of the sun's disc at sunrise and sunset is due to:
 (a) Dispersion of light
 (b) Atmospheric refraction
 (c) Scattering of light
 (d) Diffraction of light
47. Pratik conducts an experiment using an object of height 10 cm and a concave lens with focal length 20 cm. The object is placed at a distance of 25 cm from the lens:
 (a) Yes, as the image formed will be real
 (b) No, as the image formed will be inverted
 (c) No, as the image formed will be virtual
 (d) Yes, as the image formed will be erect
48. Which of the following are ionic compounds?
 (I) $MgCl_2$
 (II) HCl
 (III) CCl_4
 (IV) Na_2O
 (a) Both (I) and (II)
 (b) Both (II) and (III)
 (c) Both (I) and (IV)
 (d) (I), (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 to 52 are based on Case Study-1

Case 1: The table given below, in which samples

of four metals P, Q, R and S were taken and added to the following solutions one by one. The results obtained have been tabulated as follows.

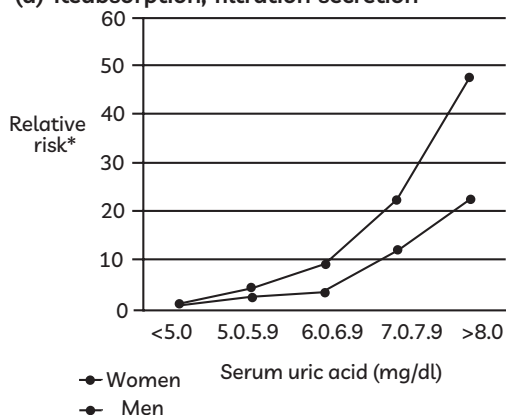
Metal	Iron (II) sulphate	Copper (II) sulphate	Zinc sulphate	Silver nitrate
P	No reaction	Displacement		
Q	Displacement		No reaction	
R	No reaction	No reaction	No reaction	Displacement
S	No reaction	No reaction	No reaction	No reaction

49. Which is the most reactive metal?
 (a) P (b) Q
 (c) R (d) S
50. Which is the least reactive metal?
 (a) P (b) R
 (c) Q (d) S
51. What would you observe if Q is added to a solution of copper (II) sulphate?
 (a) Combination reaction takes place
 (b) Decomposition reaction takes place
 (c) Displacement reaction takes place
 (d) No reaction takes place
52. The increasing order of reactivity of metals P, Q, R and S is :
 (a) $P < Q < R < S$ (b) $S < R < Q < P$
 (c) $S < R < P < Q$ (d) $Q < P < R < S$

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

Case 2: The biological process involved in the removal of harmful metabolic wastes from the body is called excretion. Different organisms use varied strategies to do this. Many unicellular organisms remove these wastes by simple diffusion from the body surface into the surrounding water while complex multicellular organisms use specialised organs to perform the same function.

53. A network of tiny blood vessels located at the beginning of a nephron is:
 (a) Renal calyces
 (b) Renal pyramid
 (c) Glomerulus
 (d) Bowman's capsule
54. Each kidney is made up of a large number of excretory units called:
 (a) Glomerulus
 (b) Nephrons
 (c) Bowman's Capsule
 (d) Blood capillaries
55. The correct sequence of urine formation is
 (a) Filtration, reabsorption, secretion
 (b) Secretion, reabsorption, filtration
 (c) Reabsorption, secretion, filtration
 (d) Reabsorption, filtration secretion



After studying the above graph, a student noted down the following observations:

- (I) The serum uric acid level is same for both men and women for risk below 10.
 (II) Serum uric acid level should be under 8.0 mg/dl for both men and women for relative risk below 10.
 (III) The normal Serum uric acid level is more for women and less for men for the same relative risk.
 (IV) The normal Serum uric acid level is more for men and less for women for the same relative risk.

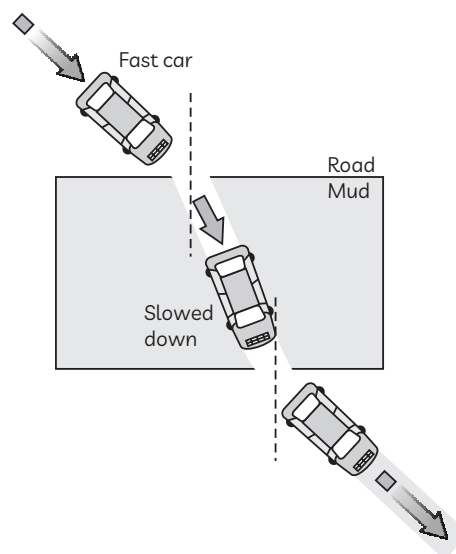
Select the correct statement(s):

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

56. The speed of light in air 300000 km/s whereas that of speed in a glass slab is about 197000 km/s. What is the reason for the difference in speed of light in two media?
 (a) Difference in density.
 (b) Difference in amount of light.
 (c) Difference in density of wind flow.
 (d) Difference in temperature.

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

Case 3: Suppose a car is travelling across the road towards a muddy track at an angle, the mud shows down one side of the car, and the path of the car bends. The more it is slowed, the more it bends. Upon exiting the track on the opposite side, the car speeds up and achieves its original speed. This analogy represents light wave travelling from rarer medium to denser medium. Thus, a ray of light travelling from a rarer medium to denser medium bends towards normal. When it travels from closer medium to rarer medium, it bends away from normal.



57. The speed of light in air 300000 km/s whereas that of speed in a glass slab is about 197000 km/s. What is the reason for the difference in speed of light in two media?
 (a) Difference in density.
 (b) Difference in amount of light.
 (c) Difference in density of wind flow.
 (d) Difference in temperature.
58. Which of the following explains the law of refraction of light through the glass slab?
 (a) Light always bends towards the normal in a glass slab.
 (b) The incident ray, the refracted ray, and the normal to the interface always lie on the same plane.
 (c) Ray of light travelling in the air is always considered as the incident ray, and the one in the glass is the refracted ray.
 (d) Ray of light always travels in a straight path irrespective of change in medium.
59. The speed of light in air is $3 \times 10^8 \text{ ms}^{-1}$, whereas that of the speed of light in water is $2.26 \times 10^8 \text{ ms}^{-1}$. What is the refractive index of water with respect to air?
 (a) 2.64 (b) 1
 (c) 1.32 (d) 0.75
60. A ray of light continues moving along the same path while passing through air, glass interface. The angle of incidence for the ray is:
 (a) zero (b) 90°
 (c) less than 90° (d) greater than 90°



SOLUTION

SAMPLE PAPER - 6

SECTION - A

1. (a) Getting salt from sea water

Explanation: The changes, which can give back the reactants by reverse process are called physical changes. hence, getting of salt from sea water is a physical change.



Related Theory

In a chemical reaction, a chemical change must occur, which is generally observed with physical changes like precipitation, heat production, colour change etc.

2. (a) $A = \text{H}_2\text{SO}_4$, $B = \text{NaCl}$, $C = \text{CaCl}_2$

Explanation: Hydrogen chloride gas is prepared by the reaction between sodium chloride (B) and conc sulphuric acid (A).



On a humid day, the gas is passed through a guard tube containing calcium chloride (C) as calcium chloride will dry the gas by absorbing the moisture.

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

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

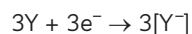
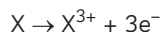
X: 2, 8, 3

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:

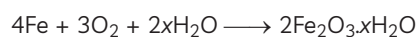


So, the cation formed will be $[\text{X}^{3+}]$ and anion formed will be $3[\text{Y}^-]$

4. (d) (I) – (D); (II) – (A); (III) – (B); (IV) – (C)

Explanation: The process in which metals are eaten up gradually by the action of air, moisture or a chemical such as acids on their surface is called corrosion.

Rusting of iron metal is the most common form of rusting and a reddish brown powder is formed on the surface of iron.



The black coating on silver, white coating on aluminium and the green coating on copper are other examples of corrosion.

5. (a) sodium hydrogen carbonate
6. (c) A: reduction; B: oxidation; Substances oxidized : Al; Substance reduced : MnO_2

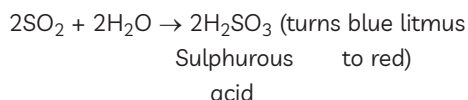
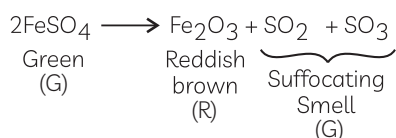
Explanation: Those reactions in which addition of oxygen to a substance or removal of hydrogen from a substance takes place are called oxidation reactions.

Those reactions in which addition of hydrogen to a substance or removal of oxygen from a substance takes place are called reduction reactions.

As oxygen is added to Al it is getting oxidized to form Al_2O_3 . Oxygen is removed from MnO_2 and therefore it is reduced to Mn.

7. (c) $FeSO_4, Fe_2O_3, SO_2, SO_3$

Explanation:



Caution

In order to solve such questions, student may use exclusive method, by crossing out the incorrect options first. For e.g., option (b) is wrong as H_2O is not a suffocating gas.

8. (a) $2NaCl_{(aq)} + 2H_2O_{(l)} \longrightarrow 2NaOH_{(aq)} + Cl_{2(g)} + H_{2(g)}$

Explanation: Observe the balanced equation.

9. (b) changes to pink

Explanation: A solution with pH 10.5 is alkaline in nature and therefore when phenolphthalein is added, it changes to pink colour.

10. (a) Endothermic Reaction

Explanation: Photosynthesis is an endothermic reaction because energy, in the form of sunlight is absorbed during the process of formation of glucose by green plants.

11. (c) Only (III)

Explanation: The rate of transpiration decreases with increase in humidity. It increases linearly with increase in wind speed, light intensity and temperature upto a certain level and then attains saturation level.

12. (b) Small intestine

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.

13. (b) Build up of lactic acid in muscles

Explanation: Sometimes, when there is a lack of oxygen in our muscle cells, the pyruvate is

converted into lactic acid which is also a three-carbon molecule. This build-up of lactic acid in our muscles during sudden activity causes cramps.

14. (d) Both (II) and (III)

Explanation: Lymph is similar to the plasma of blood but colourless and contains less protein. It drains into lymphatic capillaries.

15. (d) Both (III) and (IV)

Explanation: The diaphragm and muscles attached to ribs contract during inhalation. The thorax moves upwards and outwards during inhalation, thereby increasing the volume inside thoracic cavity.

16. (c) Translocation

Explanation: The transport of soluble products of photosynthesis is called translocation and it occurs in the phloem.

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

Explanation: The centre of curvature of a spherical mirror is not a part of the mirror as it is the centre of the sphere of which the reflecting surface is a part.

18. (a) 1.5×10^8 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

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

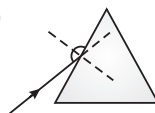
19. (d) Device X is a convex lens and distance d is its focal length

Explanation: When the parallel rays coming from a distant object (at infinity), passes through a convex lens, after refraction through the lens, the rays converge at focus on the other side of the lens. Hence, device X is convex lens and distance d is its focal length.

20. (d) 3.0 m

Explanation: In case of plane mirror, the image is as far behind mirror as the object is in front. Therefore, the distance of the image from the man = 1.5 m + 1.5 m = 3 m

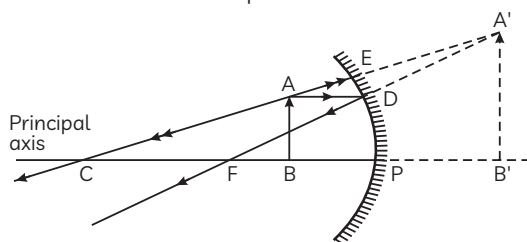
21. (d)



Explanation: As angle of incidence is the angle between the incident ray and normal drawn on the refracting surface. So, correct setup of protractor is shown in (d).

22. (d) between f and P

Explanation: Concave mirror forms an erect, virtual and enlarged image when the object is between focus and pole of mirror.



23. (a) Denser medium

Explanation: Colder air have higher refractive index than hotter air.

24. (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.

SECTION - B

25. (a) Only (I)

Explanation: Those reactions in which there is exchange of ions between two compounds to form two new compounds are called double displacement reactions.

Neutralization reaction or the reactions in which acids or acidic oxides (oxides of non-metals) react with bases or basic oxides (oxides of metals) to form salt and water are also double displacement reactions.

The reaction between copper and silver nitrate is a displacement reaction since a more reactive metal displaces a less reactive metal.

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

Explanation: The pH of a substance is related to the concentration of hydrogen or hydronium ions. An acid has a high concentration of hydronium ions and a low pH value whereas a base has a high pH value and a low concentration of hydronium ions.

So, we can say, lower the pH value, more is the concentration of hydronium ions. Therefore, the hydronium ion concentration is least in S, followed by Q, R and then P which has the maximum concentration of hydronium ions.

27. (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.

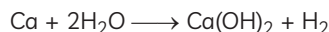


Related Theory

- 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.

28. (b) Both (I) and (IV)

Explanation: Ca reacts with cold water and calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of the metal.



29. (a) Both (I) and (III)

Explanation: Metal oxides are basic in nature as they react with acids to form salt and water. For example, $\text{CuO} + 2\text{HCl} \longrightarrow \text{CuCl}_2 + \text{H}_2\text{O}$

30. (c) it is used in killing bacteria in drinking waster and in swimming pool

Explanation: Chlorine gas is used in killing bacteria in drinking water and in swimming pool.

31. (a) Both (A) and (R) true, and (R) is correct explanation of the (A).

Explanation: A salt formed between strong acid and weak base is an acidic salt. The pH of such salt is less than 7.

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

Explanation: In a balanced chemical equation, the total number of atoms of each element is equal on both side of the equation.



Caution

→ Balancing the chemical equation has no defined method and is purely trial and error attempt.

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

Explanation: Residual volume is the volume of air remaining in the lungs after maximum forceful expiration. It is the volume of air that cannot be expelled, thus causing the alveoli to remain open at all times.



Caution

→ The residual volume remains unchanged regardless of the lung volume at which expiration was started.

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

Explanation: Scattering of light is the phenomenon that causes the sky to appear blue. Fine dust in the earth's atmosphere scatters the sunlight. Out of all the constituent colours of sunlight, blue colour is scattered the most.

35. (b) Cu

Explanation: Metals react with acids to give salt and hydrogen gas. However, hydrogen gas is not evolved when Cu reacts with dil HCl as Cu is less reactive and therefore cannot displace hydrogen gas from the acid.

36. (d) Oxidation of carbon to carbon dioxide

Explanation: During photosynthesis, reduction of carbon dioxide to carbohydrates takes place.

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

Explanation: The direction of diffusion of carbon dioxide and oxygen gases in plants depends on the environmental conditions and the requirements of the plant.

38. (a) $A \rightarrow$ cytoplasm, $B \rightarrow$ Pyruvate

Explanation: The first step is the break-down of glucose, a six-carbon molecule, into a three-carbon molecule called pyruvate. This process takes place in the cytoplasm.

39. (b) It will bend away from normal

Explanation: Benzene has a refractive index of 1.50 whereas alcohol has a refractive index of 1.36. Therefore, benzene is optically denser than alcohol.

When light passes from a denser medium to a rarer medium it bends away from the normal.

40. (a) + 10 cm

From S.No. 3, we can say that the radius of curvature of the lens is 20 cm because when an object is placed at the centre of curvature of a convex lens its image is formed on the other side of the lens at the same distance from the lens. And, we also know that focal length is half of the radius of curvature. Thus, focal length of the lens is + 10 cm.

41. (a) Preventing oxygenated and deoxygenated blood from mixing

Explanation: The separation of the left and right side of the heart is useful in preventing oxygenated and deoxygenated blood from mixing which ensures an efficient supply of oxygen to the body

42. (b) Veins

Explanation: Veins collect the blood from different organs and bring it back to the heart. They do not need thick walls because the blood is no longer under pressure.

43. (a) 2.5 D, -40 cm

Explanation: Let f_1 and f_2 be the focal lengths of the two lenses and let their power be P_1 and P_2 .

We know that power, $P = \frac{1}{f(\text{in m})}$

Therefore,

$$P_1 = \frac{1}{0.4} = +2.5 \text{ D}; P_2 = -\frac{1}{0.2} = -5.0$$

$$\text{Power of combination} = +2.5 \text{ D} - 5.0 \text{ D} \\ = -2.5 \text{ D}$$

$$\text{Focal length of the combination} = -1 / 2.5 \text{ m} \\ = -0.4 \text{ m} = -40 \text{ cm}$$

44. (c) 24 cm behind the lens.

Explanation: Here, focal length $f = + 8$ cm (focal length of convex lens is positive)

Object distance $u = -12$ cm.

Let $v =$ image distance

Using the lens formula

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} \\ = \frac{1}{8} - \frac{1}{12} \\ = \frac{3-2}{24} = \frac{1}{24}$$

Therefore, $v = + 24$ cm.

Image is formed at a distance of 24 cm from the optical centre of the lens.

45. (a) Size of the scatterer

Explanation: The colour of the scattered light depends on the size of the scattering particles. Very fine particles scatter mainly blue light whereas larger sized particles scatter light of longer wavelengths.

46. (b) Atmospheric refraction

Explanation: Due to atmospheric refraction, the sun's rays bend continuously towards the normal before it reaches the earth's surface as it travels from a rarer medium to a denser medium.

47. (c) No, as the image formed will be virtual.

Explanation: $f = - 20$ cm $u = - 25$ cm

Using lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \\ \frac{1}{v} = \frac{-1}{20} - \frac{1}{25}$$

$$= \frac{-9}{100}$$

$$v = -\frac{100}{9} \text{ cm}$$

The negative sign represents that the image is formed in front of the lens and is virtual. Hence it cannot be obtained on screen.

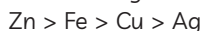
48. (c) Both (I) and (IV)

Explanation: Ionic compounds are formed between metals and non-metals by the transfer of electrons from the metal atom to the atom of non-metal. In the given question, Mg and Na are metals and Cl and O are non-metals and therefore will form ionic compounds.

SECTION - C

49. (b) Q

Explanation: According to reactivity series,



Since, Zn is the most reactive, but no metal showed reaction with ZnSO_4 . After zinc, iron is more reactive and only metal Q showed displacement reaction. Thus, it is the most reactive.

50. (d) S

Explanation: Metal S is least reactive as it could not show any displacement reaction with any of the given solutions.

51. (c) Displacement reaction takes place.

Explanation: Since Q is most reactive and displaced iron from iron sulphate, it displaces copper from copper sulphate as well.



Caution

Since Cu is less reactive than Fe and metal Q is more reactive than Fe. Then, metal Q is more reactive than Cu.

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

Explanation: Q is the most reactive and S is the least reactive metal. As metal P displaces Cu from CuSO_4 , but R does not. So, P is more reactive than R.



Caution

From the questions (A) and (B), it is clear that metal Q is most reactive and metal S is least reactive. This is only shown correctly in option (C).

53. (c) Glomerulus

54. (b) Nephrons

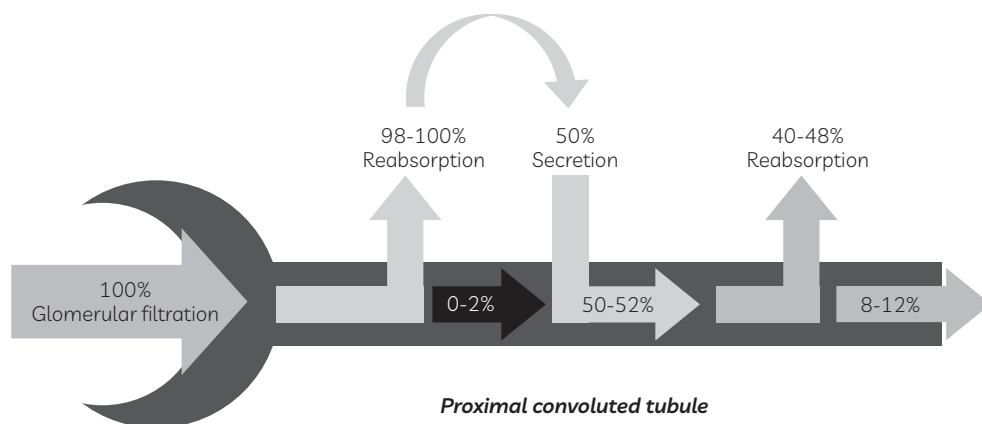
Explanation: Nephrons are the filtration units present in the kidneys which are packed close together.

Every human has two kidneys. The blood arrives at the kidney via the renal artery, which splits into many afferent arterioles. These arterioles go to the Bowman's Capsules of nephrons, where the wastes are taken out of the blood by pressure filtration. The renal pelvis takes urine away from the kidney via the ureter. Both of the ureters lead the urine into the body's only urinary bladder, which expands and sends nerve impulses when full. From there, urine is expelled through the urethra and out of the body.

55. (a) Filtration, reabsorption, secretion

Explanation: Filtration involves the transfer of soluble components, such as water and waste, from the blood into the glomerulus. Reabsorption involves the absorption of molecules, ions, and water that are necessary for the body to maintain homeostasis from the glomerular filtrate back into the blood.

Secretion involves the transfer of hydrogen ions, creatinine, drugs, and urea from the blood into the collecting duct, and is primarily made of water. Blood and glucose are not normally found in urine.



56. (c) Both (II) and (III)

Explanation: As observed from the graph, the normal level of serum uric acid is higher in women as compared to men for the same relative risk.

Also, the normal level of serum uric acid is about 2.4-6.0 mg/dL for women and 3.4-7.0 mg/dL for men

57. (a) *Difference in density*

Explanation: The speed of light varies with density as the medium with higher density decreases the speed of light and medium with lower density increases the speed of light.

58. (b) *The incident ray, the refracted ray, and the normal to the interface always lie on the same plane.*

Explanation: All the refracted rays follow the first law of refraction i.e., the incident ray, the

refracted ray and the normal to the interface of two transparent media at a point of incidence, all lie in the same plane.

59. (c) 1.32

Explanation: Speed of light in air

$$C = 3 \times 10^8 \text{ m/s}$$

Speed of light of water, $v = 2.26 \times 10^8 \text{ m/s}$

Refractive index of glass $n = \frac{C}{v}$

$$n = \frac{3 \times 10^8}{2.26 \times 10^8} = 1.32$$

60. (a) zero

Explanation: No bending of light occurs when light is incident normally on a boundary between two media, since the angle of incidence and angle of refraction, both are zero.

