SUPER 10
CBSE Class 10

SCIENCE
2021-22 Term I Sample Papers
with **OMR Sheets**

Highlights

- 10 Fully Solved Sample Papers with Marking Scheme
- CBSE Sample [illegible] 2021-22 with Solutions
- Objective Qns. & Solns. CBSE [illegible] 2021
- Objective Qns. & Solns. 202[illegible]
- Objective Qns. & Solns. CB[illegible]
- Latest Revised CBSE Syllabus for 2021-22 (issued on 28-07-2021)
- Covers all new variety Questions, Case base & MCQs etc.
- Separate OMR Answer Sheet for each Sample Paper

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CONTENTS OF FREE SAMPLE BOOK

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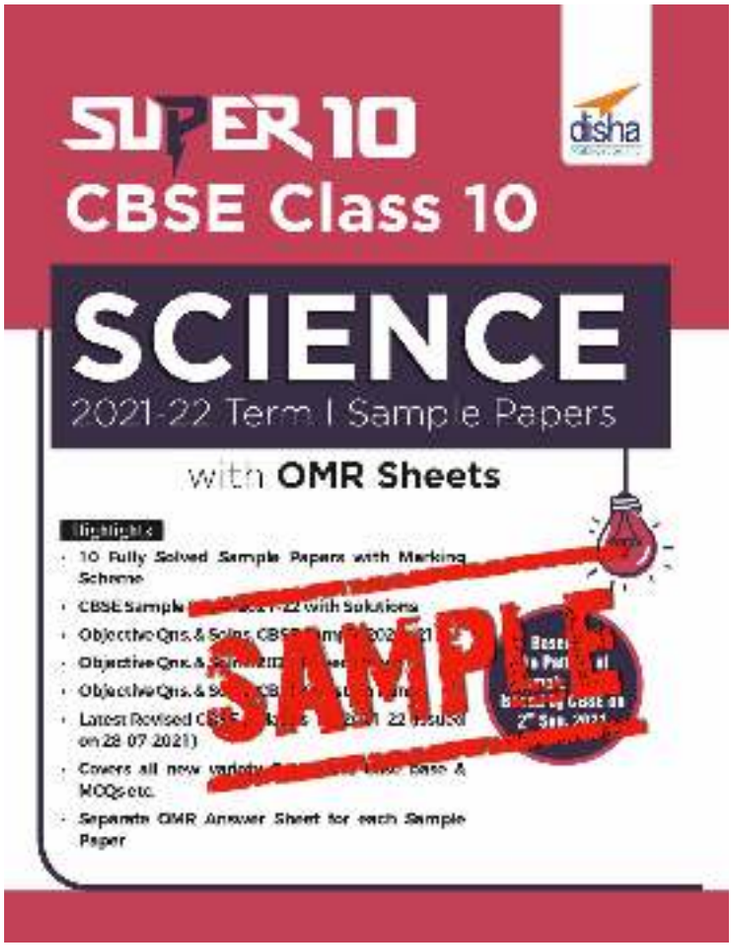

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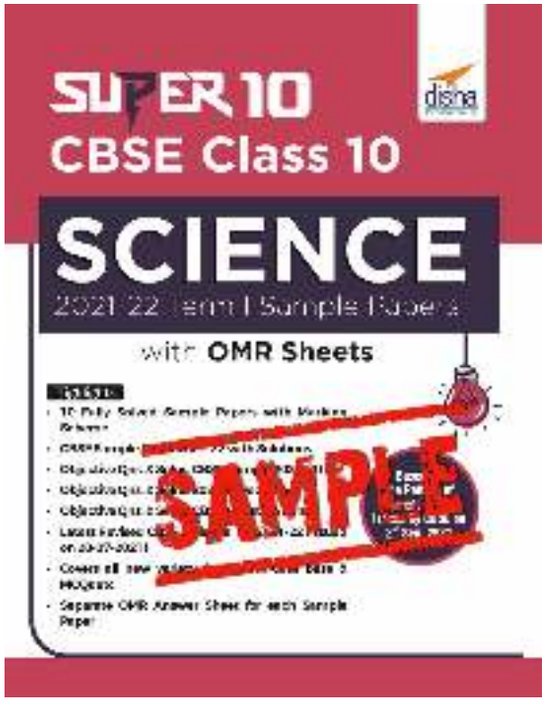
CONTENTS OF FREE SAMPLE BOOK



Sample Paper

1

Time : 90 Minutes **Max. Marks : 40**

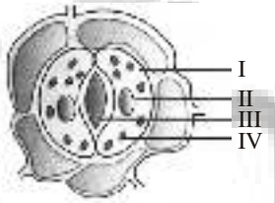
General Instructions

1. *The Question Paper contains three sections.*
2. *Section A has **24** questions. Attempt any **20** questions.*
3. *Section B has **24** questions. Attempt any **20** questions.*
4. *Section C has **12** questions. Attempt any **10** questions.*
5. *All questions carry equal marks.*
6. *There is no negative marking.*

SECTION-A

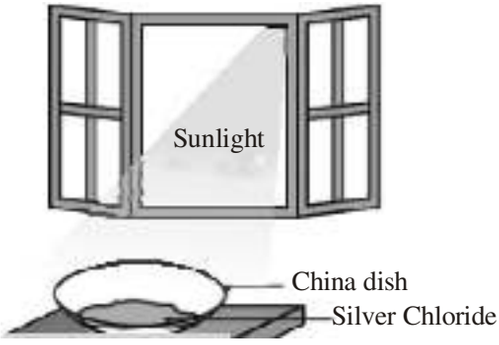
*Section – A consists of 24 questions. Attempt **any 20** questions from this section. The first attempted 20 questions would be evaluated.*

1. In the following sketch of stomatal apparatus, parts I, II, III and IV were labelled differently by four students. The correct labelling is:



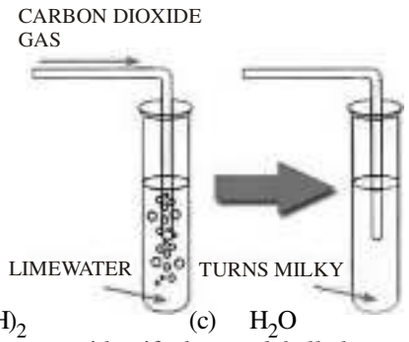
(a) I-guard cell, II-stoma, III-starch granule, IV-nucleus
(b) I-cytoplasm II-nucleus, III-stoma, IV-chloroplast
(c) I-guard cell, II-starch, III-nucleus, IV-stoma
(d) I-cytoplasm, II-chloroplast, III-stoma, IV-nucleus

2. The following picture depicts the photodecomposition of silver chloride. Photodecomposition of which compound is used in Black and white photography?



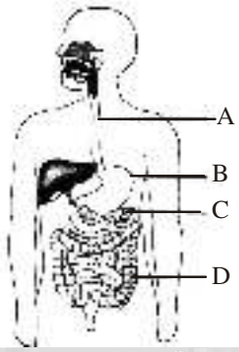
(a) silver fluoride. (b) silver bromide. (c) both (d) none of these

3. When CO_2 is passed through lime water, it turns milky. The milkiness in due to formation of –



(a) $CaCO_3$ (b) $Ca(OH)_2$ (c) H_2O (d) CO_2

4. From the given picture of the digestive system, identify the part labelled as gastric gland.

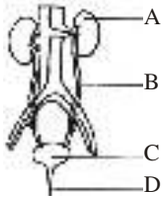


(a) A (b) B (c) C (d) D

5. Study the following figure and mark the correct matching pair.

	Column I		**Column II**
(a)	Autotrophic	(p)	Green plant.
(b)	Heterotrophic nutrition	(q)	Deer
(c)	Parasitic nutrition	(r)	*Paramaecium*
(d)	Digestion in food vaculoes	(s)	Leech nutrition

6. The diagram below represents a group of organs in the human body. Urine leaves the urinary bladder by passing through this structure labelled



(a) A (b) B (c) C (d) D

7. Among Mg, Cu, Fe, Zn the metal that does not produce hydrogen gas in reaction with hydrochloric acid is

(a) Cu (b) Zn (c) Mg (d) Fe

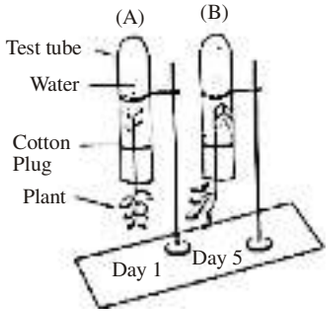
8. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$

The above reaction is an example of a:

(a) combination reaction (b) double displacement reaction

(c) decomposition reaction (d) displacement reaction.

9. Observe the test tube A & B. From the list given below, choose the combination of responses of shoot and root that are observed in B.



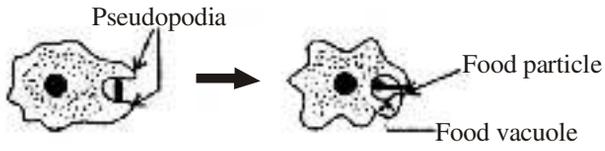
(a) Positive phototropism and positive geotropism

(b) Negative phototropism and positive geotropism

(c) Positive phototropism and negative geotropism

(d) Only negative phototropism

10.



Which activity is illustrated in the diagram of an Amoeba shown above?

(a) Ingestion (b) Digestion (c) Egestion (d) Assimilation

11. Chemical A is used for water softening to remove temporary hardness. 'A' reacts with sodium carbonate to generate caustic soda. What is 'A'?

(a) Gypsum (b) Slaked lime (c) Quick lime (d) Lime stone

12. Magnesium ribbon is rubbed with sand paper before making it to burn. The reason of rubbing the ribbon is to:

(a) remove moisture condensed over the surface of ribbon.

(b) generate heat due to exothermic reaction.

(c) remove magnesium oxide formed over the surface of magnesium.

(d) mix silicon from sand paper (silicon dioxide) with magnesium for lowering ignition temperature of the ribbon.

13. Identify the endothermic process from the following

(a) Addition of conc. HCl to water (b) $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$

(c) $H_2O(l) \longrightarrow H_2O(g)$ (d) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

14. H_3PO_3 is an acid which can donote only two H^+ ions. A teacher asked Anshika and Ashima to write complete reaction between H_3PO_3 and NaOH. Which of the following are correct?

(i) Anshika wrote 3 stoichiometry for NaOH. (ii) Ashima wrote 2 stoichiometry for NaOH.

(iii) Ahshika wrote $Na_3PO_3 + 3H_2O$ as product. (iv) Ashima wrote $Na_2HPO_3 + 2H_2O$ as product.

(v) According to Anshika its a double displacement reaction.

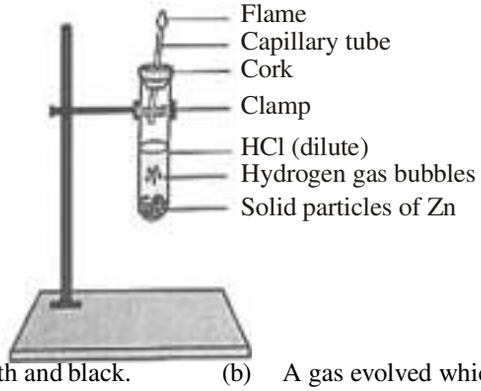
(vi) According to Ashima its a neutralization reaciton.

(a) (i), (ii), (iii) and (vi) (b) (ii), (iv) and (vi) only (c) (ii), (iv), (v), (vi) (d) All are correct

15. The metal that reacts with cold water is –

(a) mercury (b) sodium (c) zinc (d) tungsten

16. A student added dilute HCl to a test tube containing zinc granules and made following observations which one is correct?



(a) The zinc surface became smooth and black. (b) A gas evolved which burns with a pop sound.

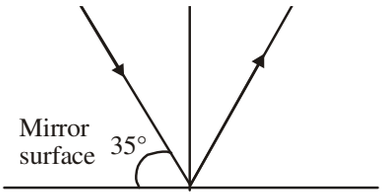
(c) The solution remained colourless. (d) The solution becomes green in colour.

17. The relation, R = 2f holds true for :
(a) concave mirrors only (b) convex mirrors only
(c) all spherical mirrors (d) lens as well as for all spherical mirrors.

18. A magnification greater than unity indicates :
(a) real image (b) size of the image is smaller than that of object
(c) size of the object is smaller than that of image (d) size of object is equal to that of image

19. Where should an object be placed in front of a convex lens to get a real image of the size of the object?
(a) At the principal focus of the lens (b) At twice the focal length
(c) At infinity (d) Between the optical centre of the lens and its principal focus.

20. Find the angle of incidence and angle of reflection from the diagram.



(a) 45°, 40° (b) 55°, 55° (c) 60°, 60° (d) 30°, 30°

21. If the refractive indices for water and diamond relative to air are 1.33 and 2.4 respectively, then the refractive index of diamond relative to water is –
(a) 5.5 (b) 1.80 (c) 3.19 (d) None of these

22. Under what conditions does a diverging lens form a virtual image of a real object
(a) Only if $u > f$. (b) Only if $u < f$.
(c) Only if $u = f$ (d) A diverging lens always forms a virtual image of a real object.

23. Focal length of a lens is 25 cm. In dioptre, power of lens will be
(a) 0.04 (b) 0.4 (c) 4 (d) 2.5

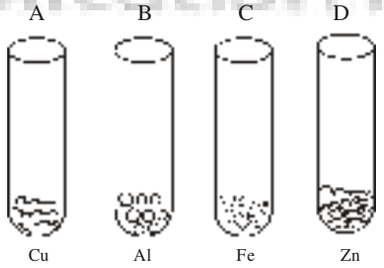
24. Which of the following is not caused by the atmospheric refraction of light?
(a) Twinkling of stars at night
(b) Sun appearing higher in the sky than it actually is
(c) Sun becoming visible two minutes before actual sunrise
(d) Sun appearing red at sunset

SECTION - B

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

25. Which of the following is a chemical method for preventing an iron frying pan from rusting?
(a) applying grease (b) applying paint (c) applying a coating of zinc (d) all of the above

26.



If we added $FeSO_4$ to above four test tubes, in which test tube we observe black residue?
(a) "A" and "B" (b) "B" and "C" (c) "A" and "C" (d) "B" and "D"

27. A student performed a reaction between egg shell and HCl. A gas 'X' produce in this reaction was passed through the solution of slaked lime, it turn milky. This milkiness disappeared to on passing excess of X due to formation of 'Y' when 'Y' is heated very strongly, above 825°C, substance 'Z' is formed which reacts vigorously with water. X, Y, Z respectively are:
(a) $CO_2, CaCO_3, Ca(HCO_3)_2$ (b) $CO_2, Ca(HCO_3)_2, CaCO_3$
(c) $CO_2, Ca(HCO_3)_2, CaO$ (d) $O_2, Ca(HCO_3)_2, CaCO_3$

28. The following observations are given for four metals:

I. Metal H does not react with dilute HCl.

II. Metal K reacts with warm water.

III. Metal L does not react with water but displaces metal H from its aqueous salt solution.

IV. Metal M reacts with cold water.

Choose the correct decreasing order of reactivity of these metals amongst the following:

(a) M > L > H > K (b) K > M > H > L (c) M > K > L > H (d) L > H > K > M

29. Consider the following reaction :

$xC_2H_6(g) + yO_2(g) \longrightarrow mCO_2(g) + nH_2O(l)$

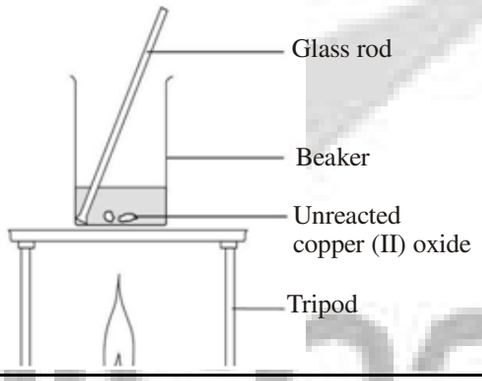
Which of the following set of coefficients balances the above redox reaction?

	x	*y*	*m*	*n*
(a)	1	3	2	2
(b)	2	7	4	6
(c)	2	3	2	2
(d)	1	7	2	3

30. CuO reacts with X, forming $CuSO_4$ and H_2O. X and type of reaction will be

(a) K_2SO_4, Displacement reaction (b) H_2SO_4, Acid-base reaction

(c) H_2SO_4, Combination reaction (d) K_2SO_4, Acid-base reaction



Question No. 31 to 35 consist of two statements-Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

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

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

(c) A is true but R is false.

(d) A is false but R is true.

31. **Assertion :** On adding H_2SO_4 to water the resulting aqueous solution get corrosive.
Reason : Hydronium ions are responsible for corrosive action.

32. **Assertion :** Different metals have different reactivities with water and dilute acids.
Reason : Reactivity of a metal depends on its position in the reactivity series.

33. **Assertion:** During physiology of excretion, deamination does not take place in liver.
Reason: Deamination is a process to make use of excess of amino acids which can not be incorporated into protoplasm.

34. **Assertion:** Danger signals are made of red colour
Reason: Velocity of red light in air is maximum, so signals are visible in dark.

35. **Assertion :** The balancing of chemical equations is based on law of conservation of mass.
Reason : Total mass of reactants is equal to total mass of products.

36. In respiration, air passes through

(a) Pharynx → nasal cavity → larynx → trachea → bronchi → bronchioles → Lungs

(b) Nasal cavity → pharynx → larynx → trachea → bronchi → bronchioles → Lungs

(c) Larynx → nasal cavity → pharynx → trachea

(d) Larynx → pharynx → trachea → lungs

37. The process of transpiration in plants helps in:
(a) Opening of stomata
(b) Absorption of CO_2 from atmosphere
(c) Upward conduction of water and minerals
(d) Absorption of O_2 from atmosphere.

38. The autotrophic mode of nutrition requires
(a) carbon dioxide and water
(b) chlorophyll
(c) sunlight
(d) all of the above

39. The figures represent three cases of a ray passing through a prism of angle A. The case corresponding to minimum deviation is

(a) 1 (b) 2 (c) 3 (d) None of these

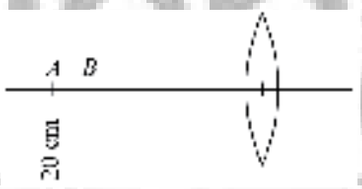
40. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?
(a) A convex lens of focal length 50 cm.
(b) A concave lens of focal length 50 cm.
(c) A convex lens of focal length 5 cm.
(d) A concave lens of focal length 5 cm.

41. The rate at which oxygen moves from the alveoli of our lungs into our blood
(a) depends on the difference in oxygen concentration between the alveoli and the blood.
(b) depends on the color of the alveoli.
(c) depends on the availability of energy to transport gases across the membrane.
(d) none of the above

42. Which one of the following animals has two separate circulatory pathways?
(a) Lizard (b) Whale (c) Shark (d) Frog

43. Find out the correct option from the following.
(A) The magnification is positive for all virtual images and is negative for all real images.
(B) The magnification of concave lens and convex mirror is always positive where as the magnification of convex lens and concave mirror can be positive or negative depending on the position of the object before the lens.
(a) Only A is true
(b) Only B is true.
(c) Both A and B are true
(d) Both A and B are false

44. A pin *AB* of length 2 cm is kept on the axis of a convex lens between 18 cm and 20 cm as shown in figure. Focal length of convex lens is 10 cm. Find magnification produced for the image of the pin.



(a) 0.83 (b) 1.00 (c) 1.25 (d) 6.78

45. In an experiment to determine the focal length of a concave lens, a student obtained the image of a distant window on the screen. To determine the focal length of the lens, she/he should measure the distance between the
(a) lens and the screen only
(b) lens and the window only
(c) screen and the window only
(d) screen and the lens and also between the screen and the window

46. Which statement best describes the property of light waves illustrated in the diagram below?

(a) Some materials absorb light waves.
(b) Some materials reflect light waves.
(c) Light waves are refracted by some materials.
(d) Light waves are emitted by some materials.

47. Light is incident on an air-water interface at an angle of 25° to the normal. What angle does the refracted ray make with the normal
(a) 19° (b) 34° (c) 25° (d) 90°

48. You are provided with aqueous solutions of three salts — A, B and C, 2-3 drops of blue litmus solution, red litmus solution and phenolphthalein were added to each of these solution in separate experiments. The change in colours of different indicators were recorded in the following table:

Sample	With blue litmus solution	With red litmus solution	With phenolphthalein solution
A	No change	No change	No change
B	Turns red	No change	No change
C	No change	Turns blue	Turns pink

On the basis of above observations, identify A, B, and C from the following options:

(a) A = NH_4Cl, B = NaCl, C = CH_3COONa (b) A = NH_4Cl, B = CH_3COONa, C = NaCl

(c) A = NaCl, B = NH_4Cl, C = CH_3COONa (d) A = CH_3COONa, B = NH_4Cl, C = NaCl

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.

Case-I

Ionic compounds are usually formed when metals react with non-metals. In other words, Elements can gain or lose electrons in order to attain their nearest noble gas configuration. Formation of ions (either by gaining or losing electrons) for the completion of octet helps them gain stability.following are some general properties for ionic compounds:

(i) **Physical Nature:** Ionic compounds are solids and are somewhat hard because of the strong force of attraction between the positive and negative ions. These compounds are generally brittle and break into pieces when pressure is applied.

(ii) **Melting and Boiling points:** Ionic compounds have high melting and boiling points (see Table). This is because a considerable amount of energy is required to break the strong inter-ionic attraction.

(iii) **Solubility:** Electrovalent compounds are generally soluble in polar solvent and insoluble in non polar solvent.

(iv) **Conduction of Electricity:** Ionic compounds in the solid state do not conduct electricity because movement of ions in the solid . Ionic compounds conduct electricity in the molten state. This is possible in the molten state since the elecrostatic forces of attraction between the oppositely charged ions are overcome due to the heat. Thus, the ions move freely and conduct electricity.

Melting and Boiling Points of Some Ionic Compounds

Compound	mp (°C)	bp (°C)
CsBr	636	1300
NaI	661	1304
$MgCl_2$	714	1412
KBr	734	1435
$CaCl_2$	782	>1600
NaCl	801	1413
LiF	845	1676
KF	858	1505
MgO	2852	3600

49. Ionic bonds could be best described as:

(a) A bond formed when 2 atoms share electrons

(b) A firm handshake

(c) An electrostatic attraction between oppositely charged ions

(d) An electrostatic attraction between anions

50. In what form can an ionic compound conduct electricity?

(a) when dissolved in water (b) when warmed slightly

(c) as a crystal (d) All of these forms

51. Which of the following compound will be best to make electrical insulator

(a) CsBr (b) $MgCl_2$ (c) MgO (d) KF

52. Which of the following compounds are not ionic compounds?

(i) $CaCl_2$ (ii) NaCl (iii) $NaHCO_3$ (iv) HCl

(v) Sugar crystals

(a) (iv) and (v) (b) (iii), (iv) and (v) (c) only (iv) (d) only (v)

Case-II

The main exretory system in humans is the urinary system. The skin also acts as an organ of excretion by removing water and small amounts of urea and salts. They remove urea, toxins, medications and excess ions and farm urine. The kidneys also balance water and salts as well as acids and bases.

Nephron is called as functional unit of kidney. It is the structure that actually produces urine in the process of removing waste and excess substances from the blood.

53. What is the approximate length and thickness of kidneys?

(a) 10cm and 5cm (b) 11cm and 3cm (c) 5cm and 3cm (d) 15cm and 5cm

54. Which structure allows the entry of blood vessels, lymph vessels and nerves to enter kidney?

(a) cortex (b) fibrous capsule (c) hilum (d) major calyx

55. The correct order of processes that occur in urine formation is

(a) glomerular filteration → secretion → reabsorption (b) secretion → glomerular filteration → reabsorption

(c) glomerular filteration → reabsorption → secretion (d) secretion → reabsorption → glomerular filteration

56. Order of toxicity among ammonia, urea and uric aicd (from lower to higher is)

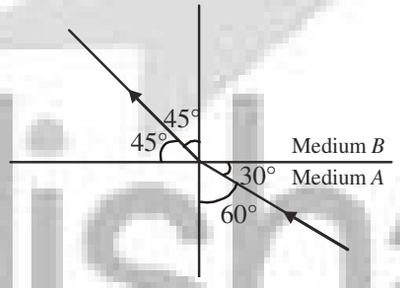
(a) uric acid < urea < ammonia (b) uric acid < ammonia < urea

(c) uric acid < uric acid < ammonia (d) uric acid < urea < uric acid

Case-III

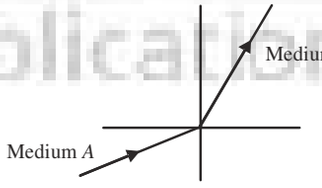
Light travels through a vacuum at a speed $c = 3 \times 10^8$ m/s. It can also travel through many materials, such as air, water and glass. Atoms in the material absorb, reemit and scatter the light, however. Therefore, light travels through the material at a speed that is less than c, the actual speed depending on the nature of the material. To describe the extent to which the speed of light in a material medium differs from that in a vacuum, we use a parameter called the index of refraction (or refractive index).

57. Figure shows a ray of light as it travels from medium A to medium B. Retractive index of the medium B relative to medium A is



(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{\sqrt{2}}{\sqrt{3}}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$

58. A light ray enters from medium A to medium B as shown in the figure. The refractive index of medium B relative to A will be



(a) greater than unity (b) less than unity (c) equal to unity (d) zero

59. On the basis of experiment 'to trace the path of a ray of light passing through a rectangular glass slab' four students arrived at the following interpretations :

I. Angle of incidence is greater than the angle of emergence.

II. Angle of emergence is less than the angle of refraction.

III. Emergent ray is parallel to the incident ray.

IV. Emergent ray is parallel to the refracted ray.

The correct interpretation is that of the student.

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

60. You are given water, mustard oil, glycerine and kerosene. In which of these media, a ray of light incident obliquely at same angle would bend the most?

(a) Kerosene (b) Water (c) Mustard oil (d) Glycerine

OMR ANSWER SHEET

Sample Paper No – 1

- ✶ Use Blue / Black Ball pen only.
- ✶ Please do not make any atray marks on the answer sheet.
- ✶ Rough work must not be done on the answer sheet.
- ✶ Darken one circle deeply for each question in the OMR Answer sheet, as faintly darkend / half darkened circle might by rejected.

Start time : _____ End time _____ Time taken _____

1. Name (in Block Letters)

2. Date of Exam

3. Candidate's Signature

SECTION-A

1.	a	b	c	d	9.	a	b	c	d	17.	a	b	c	d
2.	a	b	c	d	10.	a	b	c	d	18.	a	b	c	d
3.	a	b	c	d	11.	a	b	c	d	19.	a	b	c	d
4.	a	b	c	d	12.	a	b	c	d	20.	a	b	c	d
5.	a	b	c	d	13.	a	b	c	d	21.	a	b	c	d
6.	a	b	c	d	14.	a	b	c	d	22.	a	b	c	d
7.	a	b	c	d	15.	a	b	c	d	23.	a	b	c	d
8.	a	b	c	d	16.	a	b	c	d	24.	a	b	c	d

SECTION-B

25.	a	b	c	d	33.	a	b	c	d	41.	a	b	c	d
26.	a	b	c	d	34.	a	b	c	d	42.	a	b	c	d
27.	a	b	c	d	35.	a	b	c	d	43.	a	b	c	d
28.	a	b	c	d	36.	a	b	c	d	44.	a	b	c	d
29.	a	b	c	d	37.	a	b	c	d	45.	a	b	c	d
30.	a	b	c	d	38.	a	b	c	d	46.	a	b	c	d
31.	a	b	c	d	39.	a	b	c	d					
32.	a	b	c	d	40.	a	b	c	d					

SECTION-C

47	a	b	c	d	51	a	b	c	d	55.	a	b	c	d
48.	a	b	c	d	52.	a	b	c	d	56.	a	b	c	d
49.	a	b	c	d	53.	a	b	c	d	57.	a	b	c	d
50.	a	b	c	d	54.	a	b	c	d	58.	a	b	c	d

SECTION-D

59.	a	b	c	d	60.	a	b	c	d

No. of Qns. Attempted		Correct		Incorrect		Marks	

Page for Rough Work

Sample Paper 1

ANSWER KEYS																			
1	(b)	**7**	(a)	**13**	(c)	**19**	(b)	**25**	(c)	**31**	(a)	**37**	(c)	**43**	(c)	**49**	(c)	**55**	(d)
2	(b)	**8**	(d)	**14**	(c)	**20**	(b)	**26**	(d)	**32**	(a)	**38**	(d)	**44**	(c)	**50**	(a)	**56**	(a)
3	(a)	**9**	(a)	**15**	(b)	**21**	(b)	**27**	(c)	**33**	(b)	**39**	(c)	**45**	(a)	**51**	(b)	**57**	(a)
4	(b)	**10**	(a)	**16**	(b)	**22**	(d)	**28**	(c)	**34**	(c)	**40**	(c)	**46**	(c)	**52**	(c)	**58**	(a)
5	(a)	**11**	(b)	**17**	(c)	**23**	(c)	**29**	(b)	**35**	(a)	**41**	(a)	**47**	(a)	**53**	(b)	**59**	(c)
6	(d)	**12**	(c)	**18**	(c)	**24**	(d)	**30**	(b)	**36**	(b)	**42**	(b)	**48**	(c)	**54**	(c)	**60**	(d)

SOLUTIONS

1. **(b)** **2.** **(b)**

3. **(a)** $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

4. **(b)** Gastric glands are located in stomach (labeled B in the diagram). The gastric glands secrete digestive juice rich in protein splitting enzyme pepsin. The pepsin is secreted in an active form called pepsinogen.

5. **(a)** The sino-atrial node (SAN) is a mass by nodal tissue found in the upper part of right auricle. It generated the nerve impulse which is responsible for starting the contraction of the heart. It controls the rhythm of the heart contraction.

6. **(d)** The organ labelled A is the kidney. From the kidney, the urine moves into the ureter, labelled B in the figure. Through the urders, the urine is collected in the urinary bladdar, labelled C is the organ for the temporary stage of urine. The urethra labelled D is the duc, that carries urine from the urinary bladdar to the outside.

7. **(a)** Cu does not produce hydrogen gas on reaction with hydrochloric acid. Cu is present below hydrogen in reactivity series, i.e. it is less reactive than hydrogen.

8. **(d)** The given reaction is an example of displacement reaction as in this reaction Al displaces Fe from Fe_2O_3.

9. **(a)** In the test tube A at day 1, the plant is in the inverted position. In the fiugre at day 5, the shoot is moving towards sun-light as dt shoot shows positive phototrophism because they require sunlight for photosyntheisis the root is moving towards gravity as the root shows positive geotropism because they require dt soil for the grwoth and anchoring of plant.

10. **(a)** Amoeba has holozoic mode of nutrition Amoeba is a unicellular organism and thus has no specialised organs or strucutures for the process of nutrition. It takes place through the general body surface through pseudopodia. Amoeba intakes the food by the invagination.

11. **(b)** Chemical 'A' is calcium hydroxide (slaked lime).

$Ca(OH)_2 + Na_2CO_3 \rightarrow 2NaOH + CaCO_3\downarrow$

12. **(c)** When magnesium is exposed to air, a layer of oxide is formed on its surface and it gets corroded. So, as to remove the layer, magnesium ribbon is rubbed.

13. **(c)** Conversion of liquid to gas is endothermic process.

14. **(c)** H_3PO_3 is a dibasic acid.

$$H_3PO_3 \rightleftharpoons H^+ + H_2PO_3^-$$

$$H_2PO_3 \rightleftharpoons H^+ + HPO_3^{2-}$$

$$H_3PO_3 + 2NaOH \longrightarrow Na_2HPO_3 + 2H_2O$$

15. **(b)**

16. **(b)** $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Hydrogen gas burns with a pop sound. Zinc surface become dull and black.

17. **(c)** For all spherical mirrors $f = R/2$

18. **(c)** given, $m = \dfrac{\text{Image height}}{\text{object height}} > 1$

$\Rightarrow$ Image height > Object height

19. **(b)** **20.** **(b)**

21. **(b)** Refractive index of diamond relative to water

$$= \frac{\mu_{diamond}}{\mu_{water}} = \frac{2.4}{1.33} = 1.80$$

22. **(d)**

23. **(c)** Focal length of a lens, F = 25 cm

$f = 0.25$ m

$$P = \frac{1}{f} = \frac{1}{0.25} = 4D$$

24. **(d)** Near the horizon at sunrise and sunset, most of the blue light and shorter wavelengths are scattered away an hence sun appears red.

25. **(c)**

26. **(d)** Zn and Al are more reactive than iron, therefore they will displace iron from its salt solution giving black residue, while Cu being less reactive than iron will not able to displace iron from its salt solution.

$FeSO_4 + 2Al \longrightarrow Al_2(SO_4)_3 + 3Fe$

$FeSO_4 + Zn \longrightarrow ZnSO_4 + Fe$

$FeSO_4 + Cu \longrightarrow$ No reaction

$FeSO_4 + Fe \longrightarrow$ No reaction

27. **(c)** The egg shells are made up of calcium carbonate ($CaCO_3$)

$$CaCO_3 + HCl \longrightarrow \underset{(X)}{CaCl_2} + CO_2 + H_2O$$

$$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$$

$$CaCO_3 + H_2O + \underset{\text{excess}}{CO_2} \longrightarrow \underset{(Y)}{Ca(HCO_3)_2}$$

$$Ca(HCO_3)_2 \xrightarrow{\text{strong heating}} \underset{(Z)}{CaO} + 2CO_2 + H_2O$$

28. **(c)** Metals below hydrogen in a reactivity series does not react with dilute HCl. Medium reactive metals reacts with warm water and highly reactive metals react with cold water.

As per the given information H, K, L and M can be identified as Cu, Mg, Pb and K/Na respectively. So their reactivity order will be M > K > L >H i.e.

K > Mg > Pb > Cu.

29. **(b)** $2C_2H_6(g) + 7O_2(g) \longrightarrow 4CO_2(g) + 6H_2O(l)$

30. **(b)** CuO is basic in nature. Thus, this reaction is an acid-base reaction or neutralization reaction and double displacement reaction because both the cations and anions are exchanged.

31. **(a)** Because H_2SO_4 is a strong acid, it readily forms hydronium ions when dissolved in water which are responsible for its corrosive action.

32. **(a)** The metals placed at the top of the series are most reactive.

33. **(b)** A pacemaker is a small mass specialised cells that is located in the right atrium of the heart. It generates an electrical impulse that causes the heart muscles to move and generate a heart beat. A pacemaker regulate the number of heart beat per minute. For example, during the state of rest, the heart beats 72 times a minute, but during the state of anxiety running exhaustion, the heart rate is increased. This controlled by both medulla oblongata in the brain and pacemaker.

34. **(c)**

35. **(a)** **36.** **(b)**

37. **(c)** Transpiration is an essential phenomenon. It's pulling action helps in absorption and transportation of water in the plant. It also supplies water for photosynthesis.

38. **(d)** All the green plants are called autotrophs. This is due to the fact that the green plants make their own food from very simple substances like carbon dioxide and water that is present in the surroundings. They do this by the process of photosynthesis. These green plants contain a green pigment called chlorophyll which further helps in making food by absorbing energy received from the sunlight. Thus, the autotrophic mode of nutrition requires CO_2, H_2O, chlorophyll and sunlight.

39. **(c)** In case of minimum deviation, the light ray inside prism becomes parallel to base of the prism.

40. **(c)**

41. **(a)** The rate at which oxygen moves from the alvcoli of our lungs into our blood depends on the difference in oxygen concentration between the alveoli and the blood. More the oxygen absorbed by our using more it is absorbed into the blood and utlized by body muscles.

42. **(b)** Whale is a mammal and in mammals, two separate circulatory pathways are found - systemic circulation and pulmonary circulation. Oxygenated and deoxygenated bloods received by the left and right atria respectively pass on to the left and right ventricles. Thus, oxygenated and deoxygenated bloods are not mixed. This is referred to as double circulation.

43. **(c)**

44. **(c)** For the end B, image distance of end B will be,

$f = 10$ cm

$u_B = -18$ cm

v_B = image distance of end B

As we know,

$$\frac{1}{f}=\frac{1}{v_B}-\frac{1}{u_B}$$

$$\frac{1}{v_B}=\frac{1}{f}+\frac{1}{u_B}$$

$$\frac{1}{v_B}=\frac{1}{10}-\frac{1}{18}=\frac{8}{180}$$

$$v_B=\frac{180}{8}\Rightarrow 22.5\text{ cm}$$

Similarly, for the end A, image distance of end A will be,

$f = 10$ cm

$u_A = -20$ cm

v_A = image distance of end A

$$\frac{1}{f}=\frac{1}{v_A}-\frac{1}{u_A}$$

$$\frac{1}{v_A}=\frac{1}{f}+\frac{1}{u_A}$$

$$\frac{1}{v_A}=\frac{1}{10}-\frac{1}{20}=\frac{1}{20}$$

$v_A = 20$ cm

So, length of image $A'B' = (v_B - v_A)$

$= 22.5 - 20 = 2.5$ cm

So magnification, $m = \frac{A'B'}{AB} \Rightarrow \frac{2.5}{2} = 1.25$

45. **(a)**

46. **(c)** Light waves are refracted by some material.

47. **(a)**

48. **(c)** A neutral salt brings no change with blue litmus solution, red litmus solution and with phenolphthalein solution. An acidic salt turns blue litmus to red and brings no change in red litmus solution as well as in phenolphthalein solution. Basic salt turns red litmus to blue and also turns phenolphthalein solution pink.

Sample	Solution	With blue litmus solution	With red litmus solution	With phenolphthalein solution
A	Neutral salt (NaCl)	No change	No change	No change
B	Acidic salt (NH_4Cl)	Turns red	No change	No change
C	Basic salt (CH_3COONa)	No change	Turns blue	Turns pink

49. **(c)** **50.** **(a)**

51. **(b)** Mg^{2+} and O^{2-} ions are divalent due to which they have very strong electrostatic force of attraction. Hence MgO has very high melting point and also very low thermal conductivity.

52. **(a)** HCl is a covalent compound. Sugar crystals does not contain positive ions or negative ions. Hence, it is not an ionic compounds.

53. **(b)** **54.** **(c)** **55.** **(d)** **56.** **(a)**

57. **(a)** From figure, angle of incidence, $i = 60°$ and angle of refraction, $r = 45°$

Refractive index of the medium B relative to medium A, (from Snell's law)

$$\mu_{BA}=\frac{\sin i}{\sin r}=\frac{\sin 60°}{\sin 45°}=\frac{\left(\frac{\sqrt{3}}{2}\right)}{\left(\frac{1}{\sqrt{2}}\right)}=\frac{\sqrt{3}}{2}$$

58. **(a)** Since light rays in the medium B goes towards normal (figure), so it has greater refractive index i.e., denser w.r.t. medium A. Hence, refractive index of medium B relative to medium A is greater than unity.

59. **(c)**

60. **(d)** Among the given material kerosene refractive index, $\mu = 1.44$, water $\mu = 1.33$, mustard oil $\mu = 1.46$ and glycerine $\mu = 1.74$. Glycerine is most optically denser. Therefore, ray of light bend most in glycerine.