

(A) Glass**1. What is glass?**

Glass is chemically sodium and calcium silicate.

2. Why is glass referred to as 'Super Cooled liquid'?

The molecules of glass are arranged as in that of a liquid. On heating, glass first becomes soft and flows like a liquid. It does not have a definite melting point. Hence glass is referred to as super cooled liquid.

3. Name the raw materials required for the manufacture of glass.

- a) Soda Ash (Na_2CO_3)
- b) Lime stone (CaCO_3)
- c) Sand (SiO_2)
- d) Broken pieces of glass (Cullets)

4. Why are broken glass pieces or cullets added during the manufacture of glass?

Pieces of broken glass are added to increase fusibility and to recycle broken glass pieces.

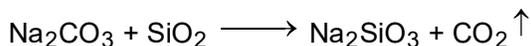
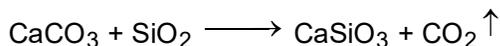
5. Mention the steps involved in the manufacture of glass.

- a) Melting
- b) Shaping
- c) Annealing
- d) Finishing

6. Briefly explain how glass is manufactured.

The raw materials used in the manufacture of glass are soda ash, lime stone, sand and cullets (broken glass pieces).

The raw materials in proper proportion are finely powdered and mixed. This mixture is fused by heating it in a furnace at high temperature (about 2073K). The charge melts and following reactions take place.



When all the carbon dioxide escapes out of the molten mass, decolourizers such as manganese dioxide is added to remove the ferrous compounds and carbon.

7. What is the role of the following in the manufacture of glass?**a) Cullets b) Manganese dioxide**

- a) Cullets are added to increase the fusibility.
- b) Manganese dioxide is added to decolourise & remove ferrous compounds and carbon.

8. How is molten glass shaped?

Molten glass is made into desired shapes by either blowing or moulding or pressing between rollers.

9. What is meant by annealing of glass? Explain

The process of gradual cooling of glass articles to room temperature is called annealing. Glass articles are allowed to cool gradually to room temperature by passing through different chambers with decreasing temperature.

10. What is the purpose of annealing?

If glass is not cooled slowly, it becomes brittle and breaks easily. On slow cooling, glass can withstand stress and lose brittleness.

11. Why should glass articles be annealed?

If glass articles are allowed to cool rapidly, glass being bad conductor of heat, the superficial layer cools down first leaving the interior portion in a state of strain. Due to this unequal expansion, the articles are likely to crack into pieces.

12. How are the air bubbles in glass removed?

Air bubbles in glass are removed by adding borax or aluminium powder to the glass and heating slowly. The air bubbles escape from glass in the process. Aluminium powder / borax settle at the bottom, which can be removed easily.

13. What is the role of borax or aluminium powder in the manufacture of glass?

The function of borax / aluminium powder is to remove the air bubbles in glass.

14. Give reason: Glass objects when held to flame acquires golden yellow colour.

The sodium content of sodium silicate present in glass makes the flame to acquire golden yellow colour to the flame.

15. Mention the properties of glass.

- Glass is chemical resistant. Glass container can hold aquaregia.
- It has smooth and shining surface. It can be polished.
- It can be moulded into different shapes.
- It can be coloured.
- It is transparent.
- It can be sketched to produce designs.
- Properties of glass can be altered suitably by including additives.
- Transparent nature of glass can be made automatically adjustable to the intensity of light.

16. What is aquaregia?

Aquaregia is a mixture of concentrated hydrochloric acid and concentrated nitric acid in the ratio 3:1

17. Why is glass a cheap substance?

The raw materials used in manufacture of glass are cheap and available in most of the geographical areas. It does not require sophisticated technology to manufacture.

18. What happens when a piece of bangle is heated in a candle flame?

When a piece of bangle is heated in a candle flame, it first becomes soft and then melts as glass does not have a definite melting point.

19. Why does glass crack when suddenly heated or cooled?

Glass is a bad conductor of heat but expands easily on heating. When it is suddenly heated or cooled, due to rapid expansion and contraction along the hot region and cold region it begins to crack.

20. What are the limitations of glass?

Glass is brittle and dense. Glass gets scratched which is difficult to remove.

21. What is the advantage of synthetic polymer over glass? OR Why is glass being replaced by synthetic polymers?

Glass is being replaced by light and transparent synthetic polymers like poly methyl metacrylate polymers. The advantages of polymers are that they are unbreakable, light and scratches on polymers can be removed by wiping with acetone.

22. Give reason: Glass bottle immersed in a vessel filled with water does not break even when water beings to boil.

Glass is a bad conductor of heat.

23. Give reason: When a glass test tube containing a mixture of chloroform and acetone is immersed in water will disappear.

The mixture of acetone and chloroform has the same refractive index as that of the glass. The surface of glass will not reflect light. Hence the test tube appears to disappear.

24. How is coloured glass prepared?

Soda-lime glass is colourless. To make coloured glass, certain metal compounds are added.

Metallic compound	Colour imparted
Ferric compound	Yellow
Ferrous & Chromium compound	Green
Cobalt compound	Blue
Nickel salts or cuprous compounds	Red

25. Give reason: Broken edges of glass have a slight greenish tinge.

Common sand used in the manufacture of glass contains some amount of iron salts. Iron salts give green colour to the glass.

26. Mention the different types of glass.

- Soda-lime glass.
- Potash-lime or Bohemian glass.
- Lead glass or flint glass.
- Borosilicate glass / Pyrex glass / Jena glass.
- Safety glass.

27. Mention the properties and uses of different types of glass.

No.	Type of glass	Additive added	Property	Uses
1	Soda-lime	-	Low cost, resistant to water melts easily	Window glass, electric bulb, plate glass, bottles, jars, Cheaper table ware
2	Potash-lime or Bohemian glass	Silica, calcium carbonate & potassium carbonate	High melting point, fuses with difficulty	Manufacture of chemical apparatus, combustion tubes
3	Lead or flint glass	Lead oxide	-	Manufacture of lenses, neon sign tubings, cathode ray tubes
4	Borosilicate or Pyrex or Jena glass	Silica and boron with small amounts of alumina	-	Preparation of pipelines, superior laboratory apparatus
5	Safety glass	Sandwiching thin layer of synthetic vinyl plastic in between two glass sheets	Does not form sharp edges when broken	Windshield of automobiles and aeroplanes

28. What property of safety glass is made use in manufacture of windshield of automobiles?

Safety glass does not form sharp edges when broken. This property is used in manufacture of windshields of automobiles and aeroplanes.

29. What is optical fibre?

Optical fibre is a flexible, transparent fibre made up of very pure glass.

30. Mention the uses of optical fibres.

Optical fibres are used as a medium for telecommunication and networking.

31. Why are optical fibres used in telecommunication and networking?

Optical fibres are flexible and can be bundled as cables hence it is used in telecommunication and networking.

32. What is photonics?

Communication using photon and optic fibres is known as photonics.

33. What are the merits / advantages of optical fibres?

- Optic fibres do not interact with air or water, so it does not corrode.
- Messages reach the destination much faster as photons transmit much faster than electrons.
- Optic fibres can transmit more messages at once, compared to transmission by electrons in a wire.

34. Give reasons:

a) **Optic fibres do not corrode.**

As optic fibres do not react with air or water

b) **Messages in optic fibres reach faster.**

As photons travel much faster than electrons.

(B) Ceramics

35. **What is ceramics?**

The products that are prepared out of specific mud are called ceramics.

36. **What are the raw materials used in the manufacture of ceramics?**

Clay like kaolinite and bentonite, Flint, White clay, Quartz and feldspar.

37. **What is clay? Mention its properties.**

Clay is complex mixture of silicates. It is a naturally occurring thermally setting substance. Clay can be moulded to any desired shape. It becomes hard and brittle on heating but it retains its shape.

38. **Briefly explain how ceramic products are prepared.**

The raw materials used in the manufacture of ceramics are clay, feldspar. Clay is mixed with required quantity of water. Desired shape is given to the mixture. Then the products are heated in a kiln. This partially eliminates water.

39. **How are the pores in ceramic articles plugged?**

The pores in the baked ceramic articles are plugged by a process of glazing.

40. **What is glazing of ceramics?**

The process of making the clay products into non-porous shining material is called Glazing.

41. **Explain glazing of ceramic articles.**

Glazing is achieved by addition of suitable fillers. It is fired again to create coloured, smooth surface.

42. **What are the merits / advantages of glazing ceramic articles?**

a) Glazing plugs the pores present in the baked ceramic articles.

b) Glazing provides a smooth, attractive look and bright glossy surface to the articles.

c) Glazing provides desired colour to the articles.

43. **What are the characteristics of ceramic articles?**

Ceramic articles are brittle, porous, heat resistant (withstand high temperature) and non-corrosive to chemicals.

- 44. Give reason: Unglazed ceramic materials are used in water filters.**
Unglazed ceramic materials use the small pores to filter dirt, debris and bacteria out of water.
- 45. How can cracking of ceramic articles be controlled?**
Cracking of ceramic articles can be controlled if non-clay materials like flint and quartz are added to the mixture.
- 46. Why addition of flint and quartz to molten glass does not shrink or get transformed?**
Flint and quartz are forms of silica, they do not absorb water. As water is not absorbed, they do not get transformed on heating and do not shrink.
- 47. What is the role of feldspar in the manufacture of glass?**
When feldspar is added, glass will have a smoother glossy finish. It also adds strength to the ceramic articles.
- 48. What is the characteristic of all ceramics manufacture?**
Shaping – drying – firing is the characteristic of all ceramic manufacture.
- 49. What is the effect of heating ceramic articles during manufacture?**
On heating ceramic materials to about 1073K to 1273K, they melt into a glass like liquid, which fills the pores between individual clay particles and strengthens their contact points. On cooling, the material becomes glossy and has shining & smooth finish.
- 50. Give reason: Water kept in porcelain container will not get cooled if it is glazed.**
Glazing plugs the pores present in porcelain articles. If pores are present, water oozes from these pores and gets evaporated. This has a cooling effect on the water inside, As the pores are plugged, water does not get evaporated hence no cooling.
- 51. Give reason: Water in an earthen pot will become cooler.**
An earthen pot has a number of pores. Water oozes out of the pores and gets evaporated. This has a cooling effect on the water inside.
- 52. Two small identical earthen pots A and B are taken. Paint is smeared thoroughly on pot A. Equal quantity of water is filled in both pots till the brim. In which pot the water will be cold? Why?**
In pot B water will be colder than that of pot A. In pot A, paint is smeared. The pores are closed. So water drops cannot evaporate through the walls. In pot B which is unpainted water evaporates and has cooling effect on the water inside.
- 53. Give reason: Pickle is stored in ceramic jars but not in earthen pots.**
Pickles contain oil and salt. If they are stored in earthen jars (without glazing), oil will ooze out of the pores and start leaking. In ceramic jars with glazing, oil will not leak so pickles are stored in ceramic jars.
- 54. Give reason: Lemon juice kept in metallic cup will taste different but not in ceramic cup.**

Lemon juice contains citric acid which reacts with metallic cup and makes it toxic. So it tastes different. Ceramic cup does not react with acid.

55. Mention the uses of ceramics.

- Ceramics are used as insulators (like fuse, sparkplugs etc).
- They are used to replace steel in ball bearings.
- They are used in spare parts for gas turbine engines.
- They are used in dental implants and synthetic bones.
- They are used in storing pickles
- They are used to keep water cold.
- They are used in storing chemicals in chemical laboratory.
- They can be used as substitutes to replace plastic cups.
- They are used in musical instruments like Ghatam, Jalatarang etc.

56. Write one similar character between glass and ceramics.

Glass and ceramic melt at 1073K and both are brittle.

57. Mention the advantage of the following raw material in ceramics.

Sl. No	Additive	Advantage
1	Clay	Porous, desired shape, becomes hard on heating
2	Flint	Cracking can be controlled as it does not absorb water
3	Quartz	Cracking can be controlled as it does not absorb water
4	Feldspar	Gives smoother, glossy finish. It also adds strength

58. Give reason why the following are used.

Sl. No	Use of ceramics	Reason
1	Floor vitrified tiles	Water proof, smooth, glossy finish. Available in different colours
2	Part of electric gadgetry	Non-conductor
3	Pickle jar	Non-porous, does not corrode

(C) Paper

59. How is paper prepared?

Paper is produced by pressing together moist fibres (cellulose pulp) derived from wood, rags or grasses and drying them into flexible sheets.

60. Mention the steps involved in the manufacture of paper.

- Pulping
- Mixing additives
- Drying
- Finishing

61. What is meant by pulping of paper?

Pulping is the process where wood is chipped and made into fibres.

62. How can the characteristics of paper for printing or writing be improved?

Fibres, pulp obtained from wood can be mixed with additives like chalk or china clay to improve the characteristics of paper.

63. Explain drying step in the manufacture of paper.

After obtaining paper web, water is removed from it by using air or heat. Earlier method of drying was to hang paper sheets as clothes. Now steam heated can drier are used for drying paper.

64. Briefly explain the manufacture of paper.

First wood is chipped into pieces and made into fibres. The moist fibres are pressed together. Additives like chalk or china clay may be added to improve the characteristics of paper. Then the pulp is fed into a paper machine where it forms a paper web. Water from the paper web is removed by hanging or by using steam heated can drier. Now the paper is cut into different sizes to alter its physical properties.

65. How is coated paper formed?

After normal paper is obtained, a thin coat of calcium carbonate or china clay is applied to get coated paper.

66. Strips of newspaper, filter paper and glazed paper are dipped in dilute potassium permanganate solution. Which paper will have absorbed more potassium permanganate?

The level of potassium permanganates in filter paper will be maximum as it is more porous.

67. Why do we find increased porosity, yellowish tinge and lack of tensile strength in old paper?

Paper contains significant amount of lignin. Exposure of lignin to air and sunlight causes old paper to turn yellowish.

68. How can important documents be protected from turning yellow?

Paper can be laminated to avoid fading of printed matter due to air, moisture and radiations. A thin sheet of polythene is placed on the document to be protected and it is gently heated to melt the polythene followed by solidification.

69. Mention the different types of paper.

- a) Filter paper
- b) Tissue paper
- c) Wax paper
- d) Cardboard paper

70. What are the characteristics and uses of filter paper?

Filter paper is a semi-permeable paper. It is porous in nature.

Uses:

- a) It is used to separate fine solids from liquid or air.
- b) It is used in chemical laboratory with filter funnel.
- c) Filter paper smeared with various reagents is used in pH paper.
- d) It is used in dip tea bags.

71. What are the characteristics and used of tissue paper?

Tissue paper is very light. It can be made from virgin or recycled paper.

Tissue paper is used as facial tissue napkins and house hold towels.

72. What are the characteristics and used of wax paper?

Wax / paraffin paper is moisture proof. It is made by applying wax which makes it non porous.

It is used in wrapping food for storage such as cookies, ice creams etc.

It is also used in arts and crafts.

73. Give reason: Wax paper is used in storing cookies and ice-creams.

Wax paper makes it non-porous and keeps the contents moisture resistant. Hence wax or paraffin paper is used in storing cookies, ice-creams etc.

74. How is cardboard paper prepared?

Cardboard paper has more tensile strength. This is achieved by having multi layer. It is used in post card, posters and drawing board.

75. Why does paper becomes translucent when smeared with oil?

When oil is smeared on paper, more light is transmitted through oil and less light is reflected. Hence it becomes translucent.

76. Mention the limitations of paper.

- a) Paper is not perfectly non-porous.
- b) The tensile strength reduced on wetting.

77. Write about the future of paper.

New, eco-friendly, biodegradable alternatives are being developed to expanded plastic packaging made out of paper.

Synthetic materials have been introduced as printing media as more durable material than paper.

Paper bags can replace plastic bags as they are eco-friendly.

78. Give reason: It is easy to tear wet paper than dry paper.

The tensile strength of paper decreases when paper becomes wet.

79. Why is paper considered as eco-friendly substance?

Paper is biodegradable because it can be recycled and also it gets converted into simpler substance by microorganisms.

80. List the uses of paper.

- a) Paper is used in making cups, bags, packing materials, stationary.
- b) It is used in Origami / Kirigami.
- c) It is used as filter paper in chemical laboratory to separate fine solid particles from liquids.
- d) It is used in dip teas bags.
- e) It is used in facial tissue napkins and house hold napkins.
- f) It is used in wrapping food for storage such as cookies, ice-creams etc.
- g) It is used in making post cards, posters, and display boards.
- h) It is used in pH papers.
- i) It is also used in arts and crafts.

81. Give reason: Paper absorbs water/oil.

Since paper is porous, it absorbs water and oil.

Fill in the blanks:

1. Chemically glass is a mixture of sodium and calcium silicate.
2. Mixture of sodium silicate and calcium silicate is called glass.
3. Glass is referred to as super cooled liquid.
4. Glass is transparent to visible light but opaque to infra-red light.
5. The raw materials used in glass manufacture are soda ash, lime stone and sand.
6. To increase fusibility of glass pieces of broken glass are added.
7. During manufacture of glass, cullets are used to increase the fusibility.
8. The gaseous product released during the manufacture of soda glass is carbon dioxide.
9. The substance added to decolourise the glass articles during manufacture of glass is Manganese dioxide.
10. The process of gradual cooling of glass articles to room temperature is called annealing.
11. During manufacture of glass, molten glass is cooled slowly to make it lose brittleness.
12. The function of borax / aluminium powder is to remove the air bubbles in glass.
13. The mixture of concentrated hydrochloric acid and concentrated nitric acid is called Aquaregia.
14. Aquaregia is a mixture of HCl and HNO₃ in the ratio 3:1.
15. Soda lime glass is colourless.
16. Yellow coloured glass is prepared by adding ferric compounds.
17. Green coloured glass is prepared by adding ferrous or chromium compounds.
18. Blue coloured glass is prepared by adding cobalt compounds.
19. Red coloured glass is prepared by adding nickel or cuprous compounds.
20. A person wants to use a glass vessel in his microwave oven. The type of glass that can be used is borosilicate glass.
21. The type of glass used in making electric bulbs is soda-lime glass.
22. The type of glass used in making bottles is soda-lime glass.

23. The type of glass used in making chemical apparatus is potash-lime/Bohemian glass.
24. The type of glass used in making combustion tubes is potash-lime / Bohemian glass.
25. The type of glass used in making lenses is lead glass.
26. You have to prepare a prism to disperse light to get spectrum. The glass used is lead glass.
27. The type of glass used in making neon sign tubings is lead glass.
28. The type of glass preferred to make superior laboratory apparatus is borosilicate / Pyrex / Jena glass.
29. The type of glass used in making windshields of automobiles is safety glass.
30. Communication using photon and optic fibre is known as photonics.
31. Materials prepared out of specific mud are called ceramic.
32. The process of making clay products non-porous and shining is called glazing.
33. The word 'ceramics' is derived from the Greek word 'Keramos'. Meaning burnt earth.
34. Cracking of ceramic articles can be controlled by non-clay materials like flint/quartz.
35. The material added to ceramics to add strength is feldspar.
36. The characteristic of ceramics is shaping-drying-firing.
37. Ceramic articles melt into liquid at a temperature of about 1073 to 1273K.
38. Water kept in porcelain containers do not become cold due to the absence of holes.
39. A material that can be safely be used in making fuse box is porcelain.
40. A musical instrument that is made of ceramic material is Ghatam / Jalatarang.
41. The word paper is derived from papyrus.
42. The process of chipping wood and making into fibres is called pulping.
43. The substance added to improve the characteristics of writing paper is chalk or china clay.
44. The substance used in coating paper is calcium carbonate or china clay.
45. The type of paper used in dip tea bags is filter paper.
46. They type of paper used in wrapping cookies or ice-cream is wax or paraffin paper.
47. Wax paper is also known as paraffin paper.
48. The major natural polymer present in paper is Cellulose.
49. The coating chemical used to coat paper in the final stage of manufacturing paper is Calcium carbonate or china clay.
50. Paper turns yellowish with age due to the presence of the chemical lignin.
