



#### **CHEMISTRY**

# BOOKS - PEARSON IIT JEE FOUNDATION

#### **NATURE OF MATTER**

**Example** 

**1.** Why do solids have any number of free surfaces and gases have no free sufaces at all

? Also compare with liquids.



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2. Arrange different states of matter in the increasing order of their densities with appropriate reason.



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**3.** (i) Pressure cooker reduces the cooking time. Explain the priciple involved.

(ii) Fish and meat can be preserved for a longer time in ice if common salt is added to it. Give reason.

(iii) When a glass of ice cold water is kept open at room temperature, what observation is found? Give reason.



**4.** When two pieces of ice are pressed together, they form a single lump. Explain



**5.** Why does temperature remain constant as heated liquid gets converted to its gaseous state at its boiling point?



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**6.** The critical temperature of gases A, B, C and D are  $-118^{\circ}$ C,  $-240^{\circ}$ C,  $132^{\circ}$ C and  $20^{\circ}$ C, respectively. Arrange them in the decreasing order of intermolecular force of attraction.



**7.** What happens when water is kept in a plastic bottle wrapped with a wet towel?



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**8.** Why are cotton clothes prefferred in summer?



**9.** Discuss the change in energy and arrangement of molecules on increasing temperature of ice from  $-5^{\circ}$ C to  $10^{\circ}$  C at 1 atm pressure.



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**10.** "All pure substances are homogeneous. But, all homogeneous substances are not pure". Justify



11. Water is a compound. Explain.



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12. How is oxygen prepared from air?



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**13.** Suggest a method of separation for a mixture of sodium chloride and ammonium

chloride. Explain the process.



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**14.** Mention the separation method and property exploited in the speration of the following solid-solid mixtures.

- (a) S + sand
- (b)  $I_2$  + sand
- (c )  $KNO_3 + NaCl$



**15.** How will you separate sulphur dioxide gas from the gaseous mixture of  $SO_2$  and  $O_2$ ?



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**16.** When soda water bottle is kept open for sometime, it loses the tangy taste. Give reason.



**1.** What is the effect of addition of impurities on freezing and boiling of a substance ?



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**2.** What is a freezing mixture ? Give an example.



**3.** Define melting point. What is the effect of pressure on melting point?



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4. What are cohesive and adhesive forces?



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**5.** Cotton clothes producing cooling effect during summer is an application of \_\_\_\_\_.



6. Clothes dry fast on a windy day. Why?



**7.** Is it possible to liquefy  $CO_2$  gas at  $50^\circ$  C ?

Give a reason.



**8.** A mixture of sand and  $NH_4Cl$  can be separated by \_\_\_\_ method.



**9.** Define latent heat of fusion. Give its value for ice.



**10.** What is meant by atomicity of an element? Give some examples of polyatomic elements.



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**11.** Distinguish between filtration and centrifugation.



**12.** Silver is a substance which expands on melting, so, its melting point \_\_\_\_ when pressure is raised.



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**13.** Give an example each for solid-liquid and solid-solid types of a homogeneous mixture.



<b>14.</b> The atomicity of the element phosphorus is
•
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<b>15.</b> is the method of separating heavier
fat particles of milk from lighter water.

**16.** A metal "A" reacts with a metallic chloride of "B" to give metal "B". But metallic chloride of "A" cannot give metal "A" on reaction with metal "B". What conclusion can you draw from this?



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**17.** Solubility of a gas in a liquid \_\_\_\_ with rise of temperature.



**18.** Give an example for a liquid-liquid heterogeneous mixture. Suggest a method of separation for it.



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**19.** The forces of attraction existing between similar molecules are .



- **20.** How do you separate a mixture of
- (a)  $CO_2$  and  $O_2$  and (b)  $H_2$  and  $O_2$ ?



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21. The formation of phosphorus pentachloride from phosphorus trichloride and chlorine gas is a \_\_\_\_\_ type of combination reaction.



22. The addition of  $MnO_2$  to  $KClO_3$  decreases the temperature at which  $KClO_3$  decomposes because  $MnO_2$  added acts as a catalyst.



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23. What is paper chromatography?



**24.** A mixture of  $NH_3$  and  $H_2$  can be separated by applying pressure, because of their high difference in \_\_\_\_\_.



25. Why is sodium kept under kerosene?



**26.** A compound is always \_\_\_\_\_.

**27.** A reaction of decomposition of a compound AB is accompanied by absoltion of some heat energy.

What is the sign of  $\Delta H$  ?



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**28.** The temperature above which no amount of pressure can cause a gas to liquefy is \_\_\_\_.





29. What is sublimation? Give some examples.



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## **Short Answer Type Questions**

**1.** When two ice cubes are pressed, they join together. Explain the principle involved.



2. Why are cotton clothes prefferred in summer?



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3. How is liquefaction different from condensation?



**4.** Differentiate between evaporation and boiling.



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**5.** Why are droplets of water observed on the outer walls of a glass tumbler containing ice?



**6.** What is a double decomposition reaction? Give an example each for neutralisation and precipitation reactions.



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**7.** Why is it not possible to displace fluorine from metallic fluorides by any other halogens ?



**8.** Explain the process of condensation with respect to kinetic molecular theory.



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**9.** What is critical temperature ? How does it affect the liquefaction of gas ?



**10.** Why does steam cause more severe burns than boiling water?



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**11.** What is the differences between Physical and Chemical Changes ?



**12.** Mention different types of combination reactions with example.



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### **Essay Type Questions**

**1.** Suggest the possible methods of separation of liquid-gas mixtures. Explain each method with an example.



- 2. Explain the factors affecting
- (a) melting point
- (b) boiling point
- (c) evaporation



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**3.** Give the postulates of kinetic molecular theory of matter. Explain the process of melting on the basis of this theory.



**4.** Explain the process of separation of different constituents in coloured ink.



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Level 1

**1.** Boiling point of rainwater is less than that of sea water.



2. Liquid has only one free surface.



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**3.** The rate of evaporation decreases with increases in humidity.



**4.** During melting of a solid, there is no change in the kinetic energy of molecules.



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**5.** The reaction of sodium chloride with bromine gas is a chemical displacement reaction.



**6.** The strong intermolecular forces of attraction are responsible for high rigidity of solids.



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**7.** Burning of a piece of magnesium wire is a synthesis reaction.



8. A mixture of  $SO_2, H_2$  and  $Cl_2$  can be separated by \_\_\_\_\_\_. 

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**9.** A liquid wets the given surface if \_\_\_\_\_ forces are predominant over \_\_\_\_ forces.



**10.** A mixture contains nitre, common salt and silver chloride as the components. The different separation techniques involved are\_\_\_\_, \_\_\_ and \_\_\_\_.



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**11.** The reactions of a compound KX with fluorine, chlorine, bromine in three different reactions are given below:

 $2KX+F_2
ightarrow2KF+X_2$ 

 $2KX+Cl_2
ightarrow 2KCl+X_2$ 

 $2KX+Br_2
ightarrow 2KBr+X_2$ 

then KX is \_\_\_\_.



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12. In two closed containers, substances A and B are present. After sometime, the lid of the container containing substance A along with a lot of pressure got off. This is because substance A \_\_\_\_\_.



13. If cold water is poured on flask containing very hot distilled water and water vapour, the water inside the flask started to boil below  $100^{\circ}$  C. The principle involved is \_\_\_\_\_.



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**14.** Three solid substance x, y and z are heated, the number of free surfaces of substances x and y decreases to zero and one, respectively. The number of free surfaces

of z does not changes. The substances associated with an increase in PE is/are



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C	olumn A	Column B
A.	Photolysis	() a. Fe + S $\rightarrow$ FeS
<b>B</b> .	Electrolysis	( ) b. $2KI + Cl_2 \rightarrow 2KCl + I_2$
C.	Element-element combination	( ) c. CaO + $H_2O \rightarrow$ Ca(OH) <sub>2</sub>
D.	Compound- compound combination	() d. $PCl_3 + Cl_2 \rightarrow PCl_5$
E.	Chemical displacement	() e. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
F	Double decomposition	() f. $2H_2O \rightarrow 2H_2 + O_2$
G.	Element— compound combination	( ) g. Pb(NO) <sub>2</sub> + 2HCl + PbCl <sub>2</sub> + 2HNO <sub>3</sub>
H	Combustion	() h. CaO + CO <sub>2</sub> $\rightarrow$ CaCO <sub>3</sub>
I.	Hydrolysis	() i. $AgBr_2 \rightarrow Ag + Br_2$

15.

**16.** The bulb of a thermometer when dipped in petrol and then taken out, the level of the mercury thread in the thermometer.

- A. starts falling
- B. starts rising
- C. remians at the same level
- D. initially falls and then rises

Answer: A

17. The high diffusibility of gases is due to

A. high intermolecular forces of attraction

B. high KE of molecules

C. restricted translatory motion in upward

direction

D. all the above

**Answer: B** 

**18.** During summer days, water kept in an earthen pot (pitcher) becomes cool because of the phenomenon of :

A. condensation

B. evaporation

C. freezing

D. fusion

Answer:

**19.** The electric bulb on long use forms a black coating on its inner surface. The process associated with this is

A. melting of tungsten `

B. sublimation of tungsten

C. oxidation of tungsten

D. reduction of tungsten

Answer: B

**20.** Identify a physical change among the following:

A. respiration

B. digestion of food

C. burning of wax

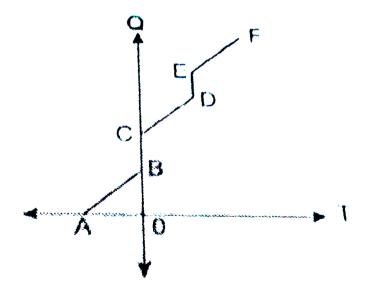
D. glowing of an electric bulb

**Answer:** 



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21. During a phase transition of a substance the temperature (T) verse heat energy (Q) graph is shown below. Identify the regions of the graph which show an increase in only PE.



A. AB, BC

B. BC, DE

C. CD, EF

D. all the regions in the given graph

### **Answer:**

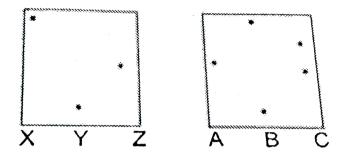


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22. A chromatogram of pure samples of food colours X, Y and Z is given in the following illustration 1. Three samples of same food materials A, B and C are analysed for purity,

with the help of the chromatogram in

illustration 2. Identify the impure sample.



- A. A
- B. B
- C. C
- D. A and C

**Answer:** 



23. Maximum intermolecular forces of attraction exists in

A. bromine

B. air

C. oxygen

D. copper

### **Answer: D**



**24.** A gaseous mixture of A, B and C is pased through water. The gaseous mixture B and C remains. If this gaseous mixture of B and C is subjected to sudden expansion followed by application of high pressure, B liquefies leaving behind C. Identify the set of gases.

A.  $SO_3$ ,  $NO_2$ ,  $O_2$ 

B.  $Cl_2$ ,  $SO_2$ ,  $H_2$ 

 $\mathsf{C}.\,CO_2,\,CO,\,N_2$ 

D.  $NH_3, N_2, H_2$ 

### **Answer:**



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# **25.** Identify the element from the following:

A. air

B. iodine vapour

C. water

D. amalgam

### **Answer:**



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**26.** In which of the following cases, cooking is very slow?

- A. pressure cooker at sea level
- B. pressure cooker at higher altitude
- C. open vessel at sea level
- D. open vessel at higher altitude

### **Answer:**



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**27.** Which of the following reactions is not a combination reaction?

A. reaction of iodine with white phosphorus

B. reaction of iron with sulphur

C. addition of water to lime

D. addition of concentrated sulphuric acid to sugar

### **Answer:**



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**28.** A mixture of three liquids X, Y and Z when subject to fractional distillation, the order in which the vapours condense back to liquid state in fractioning towers is Y, X and Z.

Arrange them in the correct order of vapour pressures.

A. 
$$Z < X < Y$$

$$\mathsf{B.}\, Y < X < Z$$

$$\mathsf{C}.\,X < Y < Z$$

$$\operatorname{D}\!.\, X < Y < Z$$

### **Answer:**



**29.** Grease spots from garments can be separated by a method of

- A. chromatography
- B. solvent extraction
- C. sublimation
- D. dissolution in suitable solvents

### **Answer:**



**30.** Which of the following involves both neutralisation as well as precipitation?

A. reaction between baking powder and

 $H_2SO_4$ 

B. reaction between  $BaCl_2$  and  $Na_2SO_4$ 

C. reaction between  $AgNO_3$  and HCl

D. reaction between slaked lime and

 $H_2SO_4$ 

# **Answer:**



**31.** Arrange the following changes of energy during following phase transition in a proper order.

$$(0^{\circ}C) 
ightarrow \mathrm{water} \ \ (50^{\circ}C) 
ightarrow \mathrm{ice} \ \ (0^{\circ}C)$$

- (1) potential energy increases and kinetic energy remains constant
- (2) potential energy decreases and kinetic energy remains constant
- (3) potential energy increases and kinetic energy increases

(4) potential energy decreases and kinetic energy decreases

A. 4 2 3 1

B. 1324

C. 1342

D. 3 4 1 2

### Answer:



**32.** For the separation of red ink from blue ink a technique is used which is described below.

Arrange the statements in a proper sequence.

- (1) The blue and red ink form spots at certain distances on the paper.
- (2) Paper chromatography is used for the sepration.
- (3) Paper and solvent are taken as stationary and mobile phases, respectively.
- (4) A narrow strip of paper with a line drawn is cut and a mixture of red and blue ink with the help of capillary is placed on the line marked

on the paper.

(5) The papar is suspended in the closed jar with the help of hook.

A. 2 4 3 5 1

B. 2 5 3 1 4

C. 2 3 4 5 1

D. 14532

### **Answer:**



**33.** Among the following, identify the substance in which molecules posses vibratory, rotatory and translatory motions in all directions except in one direction.

A. bromine

B. iodine

C. ammonia

D. silicon dioxide

### **Answer:**



**34.** In Darjeeling, distilled water boils at a temperature

- A. above 373 K
- B. above 473 K
- C. below 373 K
- D. at 373 K

### **Answer:**



- 35. At melting point,
  - A. kinetic energy remains constant and potential energy increases
  - B. kinetic energy increases and potential energy remains constant
  - C. both potantial energy and kinetic energy increase
  - D. potential energy increases with a decrease in kinetic energy

### **Answer:**



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**36.** Which among the following statements is true?

A. The rate of evaporation in a coastal area

is less when compared to a non-coastal

area.

B. The rate of evaporation in a non-coasta area is less when compared to a coastal area.

C. In both the areas the rate of evaoration is the same

D. None of the above

### **Answer:**



**37.** Which among the following is not a homogeneous mixture?

A. solder

B. aqueous solution of NaCl

C. sulphur in carbon disuphide

D. suphur in water

### **Answer:**



**38.** Gunpowder is a \_\_\_\_\_.

A. solid-liquid homogeneous mixture

B. solid-liquid heterogeneous mixture

C. solid-solid homogeneous mixture

D. solid-solid heterogeneous mixture

### **Answer:**



**39.** Which of the following gases can be separated completely from a mixture by using water as a solvent?

- A.  $CO_2$  and  $O_2$
- $B. N_2$  and  $NH_3$
- $C. CO_2 \text{ and } NH_3$
- $D. H_2$  and  $N_2$

### **Answer:**



**40.** Identify the mixture which can be separated by magnetic separated by magnetic separation method.

- A. chalk powder + sand
- B. iron + sand
- C. common salt + sand
- D. sulphur + sand

### **Answer:**



- 41. Which among the following is true?
  - A. Air is a bad conductor of heat and thermal expansion of solids is more than that of gases.
  - B. Air is a good conductor of heat and thermal expansion of solids is less than that of gases.
  - C. Air is a bad conductor of heat and thermal expansion of solids is less than

that of gases.

D. Air is a good conductor of heat and thermal expansion of solids is more than that of gases.

### **Answer:**



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**42.** Which of the following phenomena is based on the principle that cooling results due to evaporation?

A. formation of water drops on the surface of cold drink bottle.

B. formation of crystals of ice on the inner surface of the lid of an ice cream box in freezer

C. white foggy appearance on the surface of large ice blocks

D. stretching out of tongues by dogs during summer

# **Answer:**

**43.** Which among the following is the false statement?

A. Water boils below  $100^{\circ}$  C on mountain peaks.

B. Ice undergoes sublimation on surface of moon.

C. Ice melts above  $0^{\circ}$  C on mountain peaks.

D. Cooking of food is faster on mountain peaks

## **Answer:**



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**44.** The order of vapour pressures of four solids is P < R < Q < S. Which of the following has the maximum tendency to sublime

A.P

B. Q

C.R

D. S

## **Answer:**



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45. Identify the methods by which the individual components of mixture containing water, potassium nitrate, sodium chloride, alcohol and carbon tetrachloride can be separated.

A. separating funnel, fraction distillation, fraction crytallisation, ditillation

B. fractional distillation, distillation, fractional crystallisation

C. separating funnel, fractional distillation,

filtration distillation

D. separating funnel, fractional distillation,

sedimentation and decantation

## **Answer:**



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Level 2

**1.** Can water be made to boil in a paper cup without the paper being burnt ? Explain.



**2.** "How is the principle of regelation applicable for welding?" Explain.



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**3.** Why molten silver cannot be used to make sharp castings?



**4.** A tarnished silver rod when kept in water containing magnesium bars regains its lustre. Justify.



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**5.** In summer, Khus Khus mats are used for reducing the heating effect. Explain the principle involved in this.



**6.** A statue coated with chemical substance X on long exposure to polluted atmosphere becomes black. This colour can be restored by treatment with  $H_2O_2$ . Identify element X and also the types of chemical changes involved.



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**7.** A mixture of X and Y on subjecting to paper chromatography gave the chromatogram 'A'. When the same mixture is subjected to heating, chromatogram B was obtained. What

do you infer from the chromatograms?



**8.** Why is solid  $CaCl_2$  spread on roads in cold countries during winter season ?



**9.** Explain the separation techniques involved in the separations of constituents in gunpowder. What types of reactions are involved in the explosion of gunpowder?



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**10.** Sodium cannot be preserved in water. However, sodium amalgan can be kept in water. Justify.



**11.** When a mixture of these four liquids is taken, how can they be separated? Justify.



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**12.** Explain why  $N_2O$  supports combustion more vigorously than air.



13. A copper rod is placen in  $AgNO_3$  solution and  $FeSO_4$  solution. What changes do you obseve? What type of reactions takes place? Justify your observation.



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**14.**  $H_2SO_4$  is always diluted by adding it to water but not by adding water to it. Justify.



15. What type of reaction is involved in the usage of AgBr in photography? The positive print developed is dipped in  $AuCl_3$  solution at the end to impart beautiful appearance to the photograph. Explain the reaction involved in this. Justfy.



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**16.** In a chemistry lab, Rina took some mercury and water in two test tubes separately. Then she drained off both the liquids and on

observing the emty test tubes, found some difference. Can you guess what the difference is ? Explain with appropriate reasons.



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17. If we keep a box of ice creasm in a freezer for too long, crystals of ice are formed inside the box. Give reasons.



**18.** Why are cotton clothes prefferred in summer?



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19. Small pieces of steel and some powdered rust are taken in two test tubes separately. What will you obseve when concentrated hydrochloric acid is poured into both the test tubes? Justify your observation.



**20.** Explain how individual gases can be separated from a gaseous mixture of  $O_2,\,H_2\,\,\mathrm{and}\,\,CO_2.$ 



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**21.** The critical temperatures of  $CO_2$  gas and  $N_2$  gas are  $31^\circ$ C and  $-147^\circ$  C, respectively. Which gas is liquefied easily and why?



**22.** Can water be boiled below  $100^{\circ}$  C temperature ? If yes, give a reason.



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Level 3

**1.** When glass of water is freezed, formation of ice starts from the top layer but melting of ice starts from the bottom. Justify.



2. Solids generally undergo melting on heating. But only certain specific solids like naphthalene camphor undergo sublimation. Give a reason.



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**3.** Fractional distillation of ethyl alcohol-water mixture gives a mixture of 95.6 % ethyl alcohol and 4.4 % water. Further separation can be brought about either by the addition of CaO

or by the addition of a water soluble salt such as potassium acetate. Justify the formation of pure ethyl alocohol in both the cases.



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**4.** In cold countries, ethylene glycol is used car radiators for both winter as well as summer seasons. Explain.



5. When a mixture of three miscible liquids is subjected to fractional distillation, liquid B is obtained in the receiver flask. The remaining mixture on further fractional distillation, A, is left behind in the distillation flask. On the basis of the results, comment on the critical temperatures of A, B and C when they are in gaseous state.



**6.** Dicky, Micky and Vicky had three liquids, A, B and C respectively. They mixed these liquids and observed that they form a homogeneous mixture. They wer unable to separate the liquids and asked their teacher to separate these for them. The teacher subjected the given mixture to fractional distillation. Liquid B was obtained in the receiver flask. On further distillation, A was left behind in the distillation flask. On the basis of the results, comment on the critical temperatures of A, B and C in their respective gaseous states.

7. Two ice blocks of 10 g each are placed in 2 L distilled water at 273 K. One of the ice blocks is made up of distilled water. What will you observe if the ambient temperature is also 273 K? Give reasons to support your observation.



**8.** Can phase transition be used to test the purity of gold ?



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**9.** The melting point of a non-sublimable solid is  $100^{\circ}$  C. What do you observe when small piece of this solid is taken in a test tube and placed in boiling water?



**10.** What is the shape of the meniscus observed when water and mercury are taken in two different capillary tubes and why?

