DPP(MCQ) TERM I CLASS XII

CHEMISTRY - SOLUTIONS

1.

For a dilute solution, Raoult's law states that
(A) The lowering of vapour pressure is equal to the
mole fraction of solute.
(B) The relative lowering of vapour pressure is equal to the mole fraction of solute.
(C) The relative lowering of vapour pressure is proportional to the amount of solute in solution.
(D) The vapour pressure of the solution is equal to
the mole fraction of the solute.

2.

At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is _____.
(A) less than the rate of crystallisation
(B) greater than the rate of crystallisation
(C) equal to the rate of crystallisation
(D) zero

3.

When 1 mole of benzene is mixed with 1 mole of
toluene the vapour will contain : (Given : vapour of
benzene = 12.8kPa and vapour pressure of toluene
= 3.85 kPa).
(A) equal amount of benzene and toluene as it forms an ideal solution
(B) unequal amount of benzene and toluene as it
forms a non ideal solution
(C) higher percentage of benzene
(D) higher percentage of toluene

4.

If two liquids A and B form minimum boiling

azeotrope at some specific composition then _____.
(A) A–B interactions are stronger than those between A–A or B–B.

(B) Vapour pressure of solution increases because
more number of molecules of liquids A and B can escape from the solution.
(C) Vapour pressure of solution decreases because
less number of molecules of only one of the liquids escape from the solution.
(D) A–B interactions are weaker than those

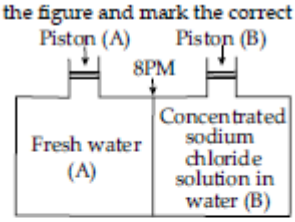
between A–A or B–B.

5.

Considering the formation, breaking and strength
of hydrogen bond, predict which of the following
mixtures will show a positive deviation from Raoult's law?
(A) Methanol and acetone.
(B) Chloroform and acetone.
(C) Nitric acid and water.
(D) Phenol and aniline.

6.

Consider the figure and mark the correct option.



(A) Water will move from side (A) to side (B) if pressure lower than osmotic pressure is applied on piston (B).
(B) Water will move from side (B) to side (A) if pressure greater than osmotic pressure is applied on piston (B).
(C) Water will move from side (B) to side (A) if pressure equal to osmotic pressure is applied on piston (B).
(D) Water will move from side (A) to side (B) if pressure equal to osmotic pressure is applied on piston (A).

7.

Relative lowering of vapour pressure is a colligative
property because _____ .
(A) It depends on number of particles of electrolyte
solute in solution and does not depend on the nature of the solute particles.
(B) It depends on the concentration of a nonelectrolyte
solute in solution as well as on the
nature of the solute molecules.
(C) Is depends on the concentration of an electrolyte or non-electrolyte solute is solution as well on the nature of solute molecules.
(D) None of the above

8.

Value of Henry's constant *K***H** is _____.
(A) Increases with increase in temperature.
(B) Decreases with increase in temperature
(C) Remains constant
(D) First increases then decreases.

9.

K_H value for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 4.039, 1.67, 1.83×10^{-5}, and 0.143, respectively. Arrange these gases in the order of their increasing solubility
(A) HCHO < CH_4 < CO_2 < Ar
(B) HCHO < CO_2 < CH_4 < Ar
(C) Ar < CO_2 < CH_4 < HCHO
(D) Ar < CH_4 < CO_2 < HCHO [A]

10.

The increase in the temperature of the aqueous solution will result in its
(A) Molarity to increase
(B) Molarity to decrease
(C) Mole fraction to increase
(D) Mass % to increase R

11.

A beaker contains a solution of substance 'A'. Precipitation of substance 'A' takes place when small amount of 'A' is added to the solution. The
solution is _____.

(A) saturated (B) supersaturated
(C) unsaturated (D) concentrated

12.

A molar solution is one that contains one mole of a
solute in
(A) 1000 g of the solvent
(B) one litre of the solvent
(C) one litre of the solution
(D) 22.4 litre of the solution R

13.

Which of the following units is useful in relating
concentration of solution with its vapour pressure?
(A) Mole fraction **(B)** Parts per million

(C) Mass percentage **(D)** Molality

14.

Which of the following solutions in water has highest boiling point?
(A) 1 M NaCl **(B)** 1 M MgCl2
(C) 1 M urea **(D)** 1 M glucose

Directions : In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.
(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 and R is True

15.

Assertion (A): Molarity of a solution in liquid state changes with temperature.
Reason (R): The volume of a solution changes with change in temperature.

16.

Assertion (A): Dimethyl ether is less volatile than ethyl alcohol.
Reason (R): Dimethyl ether has greater vapour pressure than ethyl alcohol.

17.

Assertion (A): 0.1 M solution of KCl has great osmotic pressure than 0.1 M solution of glucose at same temperature.
Reason (R): In solution KCl dissociates to produce more number of particles.

18.

Assertion : Amalgam is a homogeneous solution.
Reason : Amalgam is a solution in which mercury is solute and zinc is solvent.

19.

Assertion : One molal aqueous solution of urea contains 60 g of urea in 1 kg of water.
Reason : Solution containing one mole of solute in 1000 g solvent is called one molal solution.

20.

Assertion : Dilute solution of benzene and toluene is an ideal solution.
Reason : Benzene and toluene form H-bonding with each other.

21.

Assertion : The pressure exerted by the vapour in equilibrium with a liquid at a given temperature is called its vapour pressure.
Reason : If a non-volatile solute is added to a solvent to give a solution, the vapour pressure of the solution is found to be greater than the vapour pressure of the pure solvent.

22.

Assertion : The vapour pressure of a liquid decreases if some non-volatile solute is dissolved in it.
Reason : The relative lowering of vapour pressure of a solution containing a non-volatile solute is equal to
the mole fraction of the solute in the solution.

23.

Assertion : Water boils at 373 K as the vapour pressure at this temperature becomes equal to atmospheric
pressure.
Reason : Vapour pressure of water is less than 1.013 bar at 373 K.

24.

Assertion : If a liquid solute, more volatile than the solvent, is added to the solvent, the vapour pressure of
the solution may increase *i.e.*, $p_s > p°$.
Reason : In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

25.

Assertion : If more and more non-volatile solute is added to a solvent, the freezing point of the solution

keeps on becoming higher and higher.
Reason : Presence of large amount of the solid solute allow the solution to freeze more rapidly.

26.

Assertion : When a concentrated solution is diluted by adding more water, the number of moles of solute
in the solution remains unchanged.
Reason : Number of moles of a solute is equal to the product of molarity and volume of solution in litres.
.

27.

Assertion : Elevation in boiling point and depression in freezing point are colligative properties.
Reason : All colligative properties are used for the calculation of molecular masses.

28.

Assertion : Camphor is used as a solvent in the determination of molecular masses of naphthalene, anthracene, etc.
Reason : Camphor has high molal elevation constant.
Ans(c) : Camphor has high molal depression constant.

29.

Assertion : Solutions show deviations from Raoult's law.
Reason : The cause for these deviations lies in the nature of interactions at the molecular level.

30.

Assertion : Solutions having the same osmotic pressure are called isotonic solutions.
Reason : Ca^{2+} and K^{+} ions are responsible for maintaining proper osmotic pressure balance in the cells of organisms.

31.

Read the passage given below and answer the following questions :

An ideal solution may be defined as the solution which obeys Raoult's law exactly over the entire range of
concentration. The solutions for which vapour pressure is either higher or lower than that

predicted by Raoult's law are called non-ideal solutions.
Non-ideal solutions can show either positive or negative deviations from Raoult's law depending on whether the
A–*B* interactions in solution are stronger or weaker than *A* – *A* and *B* – *B* interactions.

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) Which of the following solutions is/are ideal solution(s)?
(I) Bromoethane and iodoethane (II) Acetone and chloroform
(III) Benzene and acetone (IV) *n*-heptane and *n*-hexane
(a) only I (b) I and II (c) II and III (d) I and IV

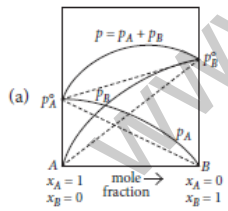
OR

For which of the following solutions ΔH_{mix} and ΔV_{mix} is negative?
(a) Acetone and aniline (b) Ethyl alcohol and cyclohexane
(c) Acetone and CS_2 (d) Benzene and toluene

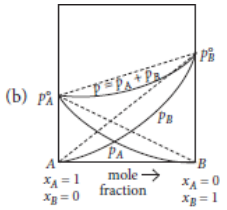
.**(ii)** Which of the following is not true for positive deviations?

(a) The *A*–*B* interactions in solution are weaker than the *A* –*A* and *B* –*B* interactions.
(b) $P_A < P^\circ_A x_A$ and $P_B < P^\circ_B x_B$
(c) Carbon tetrachloride and chloroform mixture is an example of positive deviations.
(d) All of these.

(iii) For water and nitric acid mixture which of the given graph is correct?



(c) Both of these



(d) None of these

(iv) Water-HCl mixture
(I) shows positive deviations (II) forms minimum boiling azeotrope
(III) shows negative deviations (IV) forms maximum boiling azeotrope
(a) I and II (b) II and III
(c) I and IV (d) III and IV

32.

Read the passage given below and answer the following questions :
Few colligative properties are :
(a) relative lowering of vapour pressure : depends only on molar concentration of solute (mole fraction) and
independent of its nature.

(b) depression in freezing point : it is proportional to the molal concentration of solution.
(c) elevation of boiling point : it is proportional to the molal concentration of solute.
(d) osmotic pressure : it is proportional to the molar concentration of solute.
A solution of glucose is prepared with 0.052 g at glucose in 80.2 g of water. (K_f = 1.86 K kg mol^{-1} and K_b = 5.2 K kg mol^{-1})

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) Molality of the given solution is
(a) 0.0052 m (b) 0.0036 m (c) 0.0006 (d) 0.0072

(ii) Boiling point for the solution will be
(a) 373.05 K (b) 373.15 K (c) 373.02 K (d) 372.98 K

(iii) The depression in freezing point of solution will be
(a)0.0187 K (b) 0.035 K (c) 0.082 K (d) 0.067 K

(iv) Mole fraction of glucose in the given solution is

(a) 6.28×10^{-5} (b) 1.23×10^{-4} (c) 0.00625 (d) 0.00028

OR

If same amount of sucrose ($C_{12}H_{22}O_{11}$) is taken instead of glucose then

(a) elevation in boiling point will be higher (b) depression in freezing point will be higher
(c) depression in freezing point will be lower (d) both (a) and (b)

33.

Read the passage given below and answer the following questions :

The solubility of gases increases with increase of pressure. William Henry made a systematic investigation of the solubility of a gas in a liquid. According to Henry's law "the mass of a gas dissolved per unit volume of the solvent at constant temperature is directly proportional to the pressure of the gas in equilibrium with the solution".

Dalton during the same period also concluded independently that the solubility of a gas in a liquid solution depends upon the partial pressure of the gas. If we use the mole fraction of gas in the solution as a measure of its solubility, then Henry's law can be modified as "the partial pressure of the gas in the vapour phase is directly proportional to the mole fraction of the gas in the solution".

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) Henry's law constant for the solubility of methane in benzene at 298 K is 4.27×10^5 mm Hg. The solubility of methane in benzene at 298 K under 760 mm Hg is

(a) 4.27×10^{-5} (b) 1.78×10^{-3}
(c) 4.27×10^{-3} (d) 1.78×10^{-5}

(ii) The partial pressure of ethane over a saturated solution containing 6.56×10^{-2} g of ethane is 1 bar. If the solution contains 5.00×10^{-2} g of ethane then what will be the partial pressure (in bar) of the gas?
(a) 0.762 (b) 1.312 (c) 3.81 (d) 5.0

(iii) K_H (K bar) values for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 40.39, 1.67, 1.83×10^{-5} and 0.413 respectively.

Arrange these gases in the order of their increasing solubility.
(a) HCHO < CH_4 < CO_2 < Ar (b) HCHO < CO_2 < CH_4 < Ar
(c) Ar < CO_2 < CH_4 < HCHO (d) Ar < CH_4 < CO_2 < HCHO

.

(iv) When a gas is bubbled through water at 298 K, a very dilute solution of the gas is obtained. Henry's law constant for the gas at 298 K is 150 kbar. If the gas exerts a partial pressure of 2 bar, the number of millimoles of the gas dissolved in 1 L of water is
(a) 0.55 (b) 0.87 (c) 0.37 (d) 0.66

OR

Which of the following statements is correct?
(a) K_H increases with increase of temperature
(b) K_H decreases with increase of temperature
(c) K_H remains constant with increase of temperature
(d) K_H first increases then decreases, with increase of temperature.

34.

Read the passage given below and answer the following questions :

At 298 K, the vapour pressure of pure benzene, C_6H_6 is 0.256 bar and the vapour pressure of pure toluene $C_6H_5CH_3$ is 0.0925 bar. Two mixtures were prepared as follows :
(I) 7.8 g of C_6H_6 + 9.2 g of toluene
(II) 3.9 g of C_6H_6 + 13.8 g of toluene

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) The total vapour pressure (bar) of solution I is
(a) 0.128 (b) 0.174 (c) 0.198 (d) 0.258
Vapour pressure of benzene = 0.256 × 0.5 = 0.128
Total vapour pressure of solution = 0.17425

(ii) Which of the given solutions have higher vapour pressure?
(a) I (b) II (c) Both have equal vapour pressure
(d)Cannot be predicted

(iii) Mole fraction of benzene in vapour phase in solution I is
(a) 0.128 (b) 0.174 (c) 0.734 (d) 0.266

(iv) Which of the following statements is/are correct?

(I) Mole fraction of toluene in vapour phase is more in solution I.
(II) Mole fraction of toluene in vapour phase is less in solution I.
(III) Mole fraction of benzene in vapour phase is less in solution I.

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

OR

Solution I is an example of a/an
(a) ideal solution (b) non-ideal solution with positive deviation
(c) non-ideal solution with negative deviation (d) can't be predicted.

35.

Read the passage given below and answer the following questions :

The concentration of a solute is very important in studying chemical reactions because it determines how often molecules collide in solution and thus indirectly determine the rate of reactions and the conditions at equilibrium.
There are several ways to express the amount of solute present in a solution. The concentration of a solution is a measure of the amount of solute that has been dissolved in a given amount of solvent or solution. Concentration can be expressed in terms of molarity,
molality, parts per million, mass percentage, volume percentage, etc.

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) A solution is prepared using aqueous KI which is turned out to be 20% *w*/*w*. Density
of KI is 1.202 g/mL. The molality of the given solution and mole fraction of solute
are respectively
(a) 1.95 m, 0.120 (b) 1.5 m, 0.0263
(c) 2.5 m, 0.0569 (d) 3.0 m, 0.0352

OR

The molarity (in mol L^{-1}) of the given solution will be

(a) 1.56 (b) 1.89 (c) 0.263 (d) 1.44

(ii) Which of the following is correct relationship between mole fraction and molality?

(a) $x_2 = \frac{mM_1}{1+mM_1}$ (b) $x_2 = \frac{mM_1}{1-mM_1}$

(c) $x_2 = \frac{1+mM_1}{mM_1}$ (d) $x_2 = \frac{1-mM_1}{mM_1}$

(iii) Which of the following is temperature dependent?

(a) Molarity (b) Molality (c) Mole fraction (d)Mass percentage

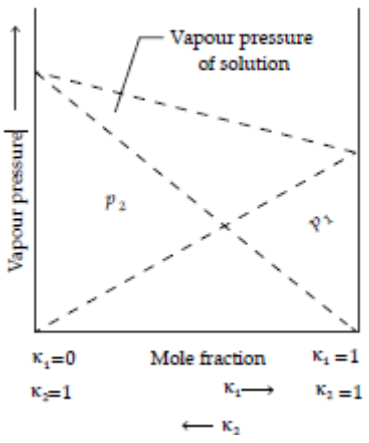
.

(iv) Which of the following is true for an aqueous solution of the solute in terms of concentration?
(a) 1 M = 1 m (b) 1 M > 1 m
(c) 1 M < 1 m (d) Cannot be predicted

36.

Read the passage given below and answer the following questions :

Raoult's law states that for a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional
to its mole fraction present in solution. Dalton's law of partial pressure states that the total pressure (ptotal) over the solution phase in the container will be the sum of the partial pressures
of the components of the solution and is given as :
Ptotal = P1 +P2



Q. 1. What type of deviation from Raoult's law does the
above graph represent ?
(A) First positive then negative
(B) Negative deviation
(C) Positive deviation
(D) First negative then positive

Q. 2. In comparison to a 0.01 M solution of glucose, the
depression in freezing point of a 0.01 M $MgCl_2$ solution is _____.
(A) the same
(B) about twice
(C) about three times
(D) about six times

Q. 3. A solution of two liquids boils at a temperature
more than the boiling point of either of them. What
type of deviation will be shown by the solution formed in terms of Raoult's law ?
(A) Negative deviation
(B) Positive deviation
(C) First positive then negative
(D) First negative then positive

Q. 4. Which of the following aqueous solutions should
have the highest boiling point ?
(A) 1.0 M NaOH **(B)** 1.0 M Na_2SO_4
(C) 1.0 M NH_4NO_3 **(D)** 1.0 M KNO_3

37.

Read the passage given below and answer the
following questions:
Boiling point or freezing point of liquid solution
would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of raising its boiling point and depressing its freezing point. The addition of non-volatile substances to a solvent decreases the vapour pressure and the added solute particles affect the
formation of pure solvent crystals.
According to many researches the decrease in freezing point directly correlated to the concentration of solutes dissolved in the solvent.
This phenomenon is expressed as freezing point
depression and it is useful for several applications
such as freeze concentration of liquid food and to find the molar mass of an unknown solute

in the solution. Freeze concentration is a high quality liquid food concentration method where
water is removed by forming ice crystals. This is done by cooling the liquid food below the freezing point of the solution. The freezing point
depression is referred as a colligative property and
it is proportional to the molar concentration of the
solution (m), along with vapour pressure lowering,
boiling point elevation, and osmotic pressure.
These are physical characteristics of solutions that
depend only on the identity of the solvent and the
concentration of the solute. The characters are not
depending on the solute's identity.

Q. 1. When a non volatile solid is added to pure water
it will:
(A) boil above 100°C and freeze above 0°C
(B) boil below 100°C and freeze above 0°C
(C) boil above 100°C and freeze below 0°C
(D) boil below 100°C and freeze below 0°C

Q. 2. Colligative properties are:
(A) dependent only on the concentration of the solute and independent of the solvent's and solute's identity.
(B) dependent only on the identity of the solute and the concentration of the solute and independent of the solvent's identity.
(C) dependent on the identity of the solvent and
solute and thus on the concentration of the solute.
(D) dependent only on the identity of the solvent
and the concentration of the solute and independent of the solute's identity.

Q. 3. Assume three samples of juices A, B and C have glucose as the only sugar present in them. The concentration of sample A, B and C are 0.1M,
.5M and 0.2 M respectively. Freezing point will be highest for the fruit juice:
(a) A
(b) B
(c) C
(d) All have same freezing point

Q. 4. Identify which of the following is a colligative
property:
(A) freezing point
(B) boiling point
(C) osmotic pressure
(D) all of the above

38.

Read the passage given below and answer the following questions :
The phenomenon of the flow of solvent through a semipermeable membrane from pure solvent to the solution is called osmosis.
Sometimes a pressure is applied to stop the process of osmosis, this is known as osmotic pressure. It is denoted by π. Osmotic pressure is expressed as : $\pi = CRT$
Since, osmotic pressure depends upon the molar concentration of solution, therefore it is a colligative property.
In these questions (Q. No. i-iv), a statement of assertion followed by a statement of reason is given. Choose
the correct answer out of the following choices.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion : If red blood cells were removed from the body and placed in pure water, pressure inside the cells
increases.
Reason : The concentration of salt content in the cells increases.
.
OR
Assertion : The osmotic pressure of a solution obtained by mixing 100 mL of 3.4% solution of urea and 100 mL of 1.6% solution of cane sugar at 293 K is 7.46 bar.
Reason : The total osmotic pressure will be equal to the sum of partial osmotic pressures.

(ii) Assertion : When a solution is separated from the pure solvent by a semipermeable membrane, the solvent
molecules pass through it from pure solvent side to the solution side.
Reason : Diffusion of solvent occurs from a region of high concentration to a region of low concentration
solution.

(iii) Assertion : Two solutions having same osmotic pressure at a given temperature are called isotonic solutions.
Reason : Osmotic pressure is not a colligative property.
.

(iv) Assertion : The preservation of meat by salting and fruits by adding sugar protects against bacterial action.
Reason : A bacterium on salted meat or candid fruit loses water due to osmosis shrivels and ultimately dies.

39.

Read the passage given below and answer the following questions :
If some solute is added to a solvent, the boiling point of solution increases. This is known as elevation in boiling point.
$\Delta T_b = K_b m$ where, K_b = Molal elevation constant
$\Delta T_b \propto m$
Hence, it is a colligative property.
Also, $K_b = \frac{MRT_b^2}{\Delta_{vap}H \times 1000}$
where, M = Molar mass of solvent
$\Delta_{vap}H$ = Enthalpy of vaporisation

Molar mass can also be calculated using elevation in boiling point.

$$M_B = \frac{K_b \times W_B \times 1000}{\Delta T_b \times W_A}$$

In these questions (Q. No. i-iv), a statement of assertion followed by a statement of reason is given. Choose
the correct answer out of the following choices.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion : In a pressure cooker, the water is brought to boil. The cooker is then removed from the stove.
Now on removing the lid of pressure cooker, the water starts boiling again.
Reason : The impurities in water bring down its boiling point.

(ii) Assertion : On dissolving 3.24 g of sulphur in 40 g of benzene, boiling point of solution get higher than
that of benzene by 0.081 K, then the formula of sulphur is S_8. (K_b for benzene = 2.53 K kg mol^{-1})

Reason : Molecular mass of sulphur comes out to be 253.

(iii) Assertion : When sugar is added to water, boiling point of water increases.
Reason : When a non-volatile solute is added to a solvent, elevation in boiling point is observed.

(iv) Assertion : Cooking time in pressure cookers is reduced.
Reason : Boiling point inside the pressure cooker in raised.

OR
Assertion : Elevation in boiling point of two isotonic solutions is same.
Reason : Boiling point depends upon the concentration of the solute.

40.

Read the passage given below and answer the following questions :
At the freezing point of a solvent, the solid and the liquid are in equilibrium. Therefore, a solution will freeze
when its vapour pressure becomes equal to the vapour pressure of the pure solid solvent.
It has been observed that when a non-volatile solute is added to a solvent, the freezing point of the solution is
always lower than that of the pure solvent.
Depression in freezing point can be given as, $\Delta T_f = K_f m$
Where, K_f = Molal freezing point depression constant

or we can write, $\Delta T_f = \frac{K_f \times W_B \times 1000}{W_A \times M_B}$

In these questions (Q. No. i-iv), a statement of assertion followed by a statement of reason is given. Choose

the correct answer out of the following choices.
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion : 0.1 M solution of glucose has same depression in the freezing point as 0.1 M solution of urea.
Reason : K_f for both has same value.

OR
Assertion : Increasing pressure on pure water decreases its freezing point.
Reason : Density of water is maximum at 273 K.
Ans(c) : Density of water is maximum at 4°C *i.e.*, 277K.

(ii) Assertion : Larger the value of cryoscopic constant of the solvent, lesser will be the freezing point of the
solution.
Reason : Extent of depression in the freezing point depends on the nature of the solvent.

(iii) Assertion : The water pouch of instant cold pack for treating athletic injuries breaks when squeezed and
NH_4NO_3 dissolves thus lowering the temperature.
Reason : Addition of non-volatile solute into solvent results into depression of freezing point of solvent.

(iv) Assertion : If a non-volatile solute is mixed in a solution then elevation in boiling point and depression in
freezing point both will be same.
Reason : Elevation in boiling point and depression in freezing point both depend on number of particles
of solute.