Mother's International Academy
Affiliated to CBSE Delhi (10+2)
A Place To Grow
Holiday – Homework (Session – 2025 – 2026)

Std.: XII

General Guidelines :

Dear parents,
Summer Vacation for the session 2025-26 is going to commence on 26th May.
The school will reopen on 27th June.
The holiday home work has been uploaded in school Website. The points are to note.
The home work has been arranged as the latest update of the curriculum
This is not just for a formality but very much needful for a student to mug up each subject from the grass root level.
Guidelines of submission of Holiday Homework.

- **All the answers will be written neatly in A4 size paper.**
- **Stick file is recommend for each subject.**
- **Students are requested to send the PPt of the chapters in miaprincipalteachers@gmail.com mentioning the candiate's name, Class, Roll No. and subject**
- **Last date of submission of holiday is 30th June, 2025.**
- **Students are requested to adhere the deadline strictly.**

English

1. Choose the correct option.

1. *The Last Lesson* by Alphonse Daudet
What was Franz's initial reaction when he was asked to recite the rules of participles?
A) He answered confidently
B) He remained silent and nervous
C) He ran out of the classroom
D) He asked for another chance

2. *Thing of Beauty* by John Keats
According to the poem, what does a "thing of beauty" provide us?
A) Eternal wisdom
B) Everlasting wealth
C) Joy and comfort forever
D) Power and strength

3. *The Rattrap* by Selma Lagerlöf
Why did the peddler call the world a "rattrap"?
A) Because he was trying to sell rat traps
B) Because people were caught in material temptations
C) Because it was full of rats
D) Because he disliked people

4. *Deep Water* by William Douglas
What incident made Douglas fear water for many years?
A) A shark attack
B) Falling into a river
C) Being pushed into a pool by a boy
D) Watching someone drown

5. *The Rattrap* by Selma Lagerlöf
What changes the peddler's outlook by the end of the story?
A) He receives money
B) He gets arrested
C) He experiences the ironmaster's daughter's kindness
D) He sells many rattraps

2.Answer the following questions in short.

1.*The Last Lesson*
Why was the last lesson so important for Franz, and how did he feel about it?

2. ***A Thing of Beauty***
How does the poet describe nature as a source of beauty in the poem?
3. ***The Rattrap***
How did the ironmaster's daughter bring about a change in the peddler's life?
4. ***Deep Water***
What steps did Douglas take to overcome his fear of water?
5. Mixed (From any of the above)
What message does the story *The Rattrap* convey about human behavior and redemption?
3. Answers the questions in detail.
1. ***The Last Lesson***
Discuss the significance of M. Hamel's "last lesson" in the context of language, identity, and patriotism. How does it reflect the emotions of the teacher, the student, and the townspeople?
2. ***A Thing of Beauty***
In what ways does Keats describe a "thing of beauty" as a lasting source of joy and comfort? Explain how the poem reflects the Romantic ideals of beauty and nature.
3. ***The Rattrap***
How does the story *The Rattrap* highlight the theme of compassion and redemption? Support your answer with examples from the ironmaster's daughter's role in transforming the peddler.
4. ***Deep Water***
Describe how the personal experience at the YMCA pool affected William Douglas and how he overcame his fear. What does this narrative teach us about courage and determination?
5. ***Thematic/Mixed Question***
Both *The Rattrap* and *Deep Water* show a transformation in the main character through struggle and kindness. Compare and contrast how these transformations occur and what message they convey.
4. Topics for the PPT

Groups of students	Topics
Section A	The Last Lesson
	Lost Spring
Section B	Deep water
	Rattrap
	A Thing of Beauty
	My Mother at Sixty Six
Section C and D	Keeping Quiet
	Roadside Stand
	Enemy

Physics

MCQ

1. **In General, metallic ropes are suspended on the carriers taking inflammable material, The reasons is**
   a) **To control the speed of the carrier**
   b) **To keep the centre of gravity of the carrier nearer to the earth**
   c) **To keep the body of the carrier in contact with the earth**
   d) **None of these**
2. **Two charges of equal magnitudes kept at a distancer exert a force F each other, If the charges are halved and distance blow them is doubled, the new force acting on each charge is**
   a) F/8 b) F/4 c) 4F d) F/16
3. **Coalumb's law in electrostatic is valid**
   a) **In all situations**
   b) **Electric charge in motion**
   c) **Mass of A < mass of B**
   d) **None of these**
4. **A charge Q is placed at the centre of the line Joining two charges q and q. The system of the three charges will be in equilibrium If Q is**
   a) +q/3 b) -q/3 c) +q/4 d) -q/4
5. **The magnitude of the electric field due to a point charge, object at a distance of 4m is 9 N/C From the sauce in charged object the electric field of magnitude 16N/C will be at a distance of**
   a) 1m b) 2m c) 3m d) 6m
6. **An electric clipole placed in a non-uniform electric field will experience**
   a) **Oney a force** c) **Both force and torque**
   b) **Oney a torque** d) **Neither force and torque**

7. **The magnitude of Electric Field intensity E is such that, an electron placed in it would experience an electrical force equal to it weight is given by**
   a) Mge b) mg c) e/mg d) e^2g
8. **The electric flux through a closed Gaussian surface depends upon**
   a) **Net charge enclosed and permitivity of the medium**
   b) **Net charge enclosed, permitivity of the medium and size of the Gaussian surface**
   c) **Net charge enclosed oney**
   d) **Permitivity of the medium oney**
9. **Electric field at a point varies as ro for**
   a) **An electric dipole**
   b) **A point charge**
   c) **A ploue Infinite sheet of charge**
   d) **None of these**
10. **The electric field inside a spherical shell of uniform surface charge density is**
   a) **Zero**
   b) **Constant, less than zero**
   c) **Directly proportional to the distance from the centre**
   d) **None of these**
11. **The electric field at a point due to an infinite sheet of the charge**
   a) **Increases with increase in distance**
   b) **Decreases with increase in distance**
   c) **Decreases with decrease in distance**
   d) **Independent of distance**
12. **On what factors does the total electric flux through a closed surface in which a certain amount of charge is placed depend**
   a) **Shape of the surface**
   b) **Size of the surface**
   c) **Total charge outside and inside the surface**
   d) **Both a & b**
13. **What is the value of electric field at the centre of the electric dipole**
   a) **It is twice the electric field due to one charge at centre**
   b) **It is thrice the electric field due to one charge at centre**
   c) **It is half the electric field due to one charge at centre**
   d) **Zero**
14. **Two charge 20c and -20c are seprated from each other by a distance of 2cm. then what is the magnitude of electric clipole moment.**
   a) 0 b) 0.2 cm c)0.4 cm d)0.8 cm
15. **Charge motion within the Gaussian surface gives changing physical quantity**
   a) Electric Field c) Charge
   b) Electric flux d) Gaussian surface area
16. **Electric flux of an electric field E through an area da is given by**
   a) E x da c) E. da
   b) E x da/ Eo d) E.da / Eo
17. **Two point charge +16q and -4q are located at x=o and x=L. The location of the point on x-axis at which the resultant electric field due to these charge**
   a) 8L b) 6L c) 4L d) 2L
18. **The electric field intensity due to an infinite cylinder of radius R and having charge q per unit length at a distance r (r >R) from its axis is**
   a) **Direct proportional to r^2**
   b) **Direct proportional to r^3**
   c) **Inversly proportional to r**
   d) **Inversly proportional to r^2**
19. **Electric field lines provide information above**
   a) Field strength c) Nature of charge
   b) Direction d) All of these
20. **Three charges +3q, tq and Q are placed on a straight line with equal sepration. In order to make the net force on q to be zero, the value of Q will be**
   a) +3q b) +2q c) -3q d) -4q

<u>Short type Questions</u>

1. **An electron moves a distance of 6cm when accelerated from rest by an electric field of strenghgt 2 x 10^4 N/C. Calculate the time of travess**
2. **Let two conducting spheres of radii r_1 and r_2 be joined by a thin wire and total charge q be given to them. Prove that the charge on the spheres will in the ratio of their radii**

3. **Draw a Graph to show the variation of E with perpendicular distance r from the line of charge**
4. **Find the work done in bringing a charge q from perpendicular distance r_1 and r_2 ($r_2 > r_1$)**
5. **A point charge (+Q) is kept in the vicienity of uncharged conducting plate. Sketch electric field lines between the charge and the plate.**

Long Question

1. **Use Gaus's law to obtain an expression for the electric field due to an Infinitey long thin straight wire with uniform linear charge density.**
2. **Explain the meaning of the statement, electric charge of a body is quantised.**
3. **A conducting sphere of radius 10cm has an unknown charge. If the electric field 20cm from the centre of the sphere is 1.5 x 10^3 N/C and points radially inward. What is the net charge on the sphere**
4. **An Infinite line charge produces a field of 9 x 10^4 N/C at a distance of 2cm. Calculate the linear charge density**
5. **(a) Define Electric flux. Write its S.I unit**

(b) how is the field directed If

   i. **The sheet is positively charged**
   ii. **Negatively charged**

6. **Two point charges tQ_1 and -Q_2 are placed r distance apart. Obtain the expression for the amount of work done to place a third charge Q3 at the the midpoint of the line joining the two charges**
7. **Can we create an electric field in which all the lone of force are parallel but their density increases continuously in a direction perpendicular to the lines of force.**
8. **Two large parallel thin metallic plates are placed closed to each other. The plates have surface charge density of opposite signs and magnitudes of 20 x10^{-12} cm^2. Calculate the electric field intensity**
   i. **In the outer region of the plates**
   ii. **In the interior region blow the plates**
9. **An electric clipole of clipole moment 20 x 10^{-6} cm is enclosed by a closed surface. What is the flux coming out of the surface.**
10. **Figure shows three point charges +2q, -q and +3q two charges +2q and -q are enclosed within a surface what is the electric flux due to this configuration through the surface s**

Fig

PPT & Presentation

   i. **Draw PPT presentation on method of charging**
   ii. **Draw PPT presentation on application of Gauss Law.**

ASSERTION AND REASON QUESTIONS

For the following questions, two statements are given-one labelled assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (a), (b), (c) and (d) as given below.

a) **Both A and R are true but 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 also false.**

1. **Assertion :- An electric force acting on a proton an electron, moving in a uniform electric field is the same, whereas acceleration of electron is 1836 times that of a proton.**

Reason : The mass of electron is less than the mass of proton.

2. **Assertion :- The force between two given charges placed at a given distance apart in water is only 1/81 of the force between them in air/vaccum.**

Reason : Electric force increases when a dielectric is inserted between the two charges.

3. **Assertion :- A body can be changed conduction and induction.**

Reason : In changing by induction, body acquires same of change.

4. **Assertion :- when two changes q_1 and q_2 are kept at some distance apart, force acting between these charges is F. If a third charges q_3 is placed quite close to q_2, the force will remains F.**

Reason : The force acting between two charges does not depend upon the presence of any other charge.

5. **Assertion :- The total number of electric lines of force passing through a given area in a normal direction is called electric flux.**

Reason : Electric flux is a vector quantity.

6. **Assertion :- Electric field lines can be have break in between.**

Reason : Single isolated charge can exist.

7. **Assertion :- In the given figure q_1 is positive and q_2 is negative**

Reason : Electric field lines emerge from positive and terminate at negative charge.

8. **Assertion :- A metallic shield in the form of a hollow shell, can be built to block an electric field.**

Reason : In a hollow spherical shell, the electric field is not zero at every point inside the shell.

9. **Assertion :- Gauss law is same din both electrostatic and magnetism.**

Reason : Isolated magnetic poles does not exist but isolated electric charges do.

10. **Assertion :- Electric field is zero inside a conductor**

Reason : Charges reside on the surface of the conductor and not inside the conductor.

CASE BASED QUESTION

1. **Electric flux through an area is defined as E . A. Gauss law is used to assess amount of enclosed change. The concept of flux and Gauss law is very useful as in cases of non planar area calculation of flux is not easy. Gauss law is also very important in calculating the electrostatic field. Flux due to change is additive in nature. Gauss law does not depend on the shape.**

I. **Gauss law is dependent on internal charge configuration**
   a) **No it's not**
   b) **Yes, it depend on charge configuration.**
   c) **May be**
   d) **Both (a) and (b)**

II. **Is it necessary condition to have symmetric surface for Gauss law application ?**
   a) **Yes** c) **May be**
   b) **No** d) **Depends on situation**

III. **Electric flux through a closed surface is due to**
   a) **Total charge enclosed.**
   b) **Total charge present on the surface.**
   c) **Total charge induced on surface.**
   d) **All of the above.**

IV. **The Gaussian surface should not be passed through any discrete charge because**
   a) **Electric field becomes zero.**
   b) **Electric field remains constant.**
   c) **Electric field due to a system of discrete charge is not well defined at location at any charge.**
   d) **Electric field is continuous charge distribution.**

2. **Electric charge is the physical property of matter that causes it to experience a force when placed in an electromagnetic field. There are two types of charges positive and negative charges. Also, like charges repel each other whereas unlike charges attract each other.**

   i. **Charged on a body which carries 200 excess electron is:**
      a) **-3.2×10^{-18} C** c) **-3.2×10^{-17} C**
      b) **3.2×10^{18} C** d) **3.2×10^{-17} C**

   ii. **Charge on a body which carries 10 excess electrons is :**
      a) **-1.6×10^{-18} C** c) **2.6×10^{-18} C**
      b) **1.6×10^{-18} C** d) **1.6×10^{-21} C**

   iii. **A body is positively charged, it implies that :**
      a) **There is only a positive charge in the body**
      b) **There is positive as well as negative charge in the body the positive charge is more than negative charge**
      c) **There is equally positive and negative charge in the body but the positive charge lies in the outer regions**
      d) **The negative charge is displaced from its position**

   iv. **Mass of electron is :**
      a) **9.1×10^{-31} kg** c) **1.6×10^{-19} kg**
      b) **9.1×10^{-31} g** d) **1.6×10^{-19} g**

3. **A conductor A with a cavity as shown in figure is given a charge Q. Another conductor B with charge q is inserted into the cavity keeping B insulated from A**

Fig :-

   i. **The entire charge must appear :**
      a) **Anywhere on sphere**
      b) **On outer surface of conductor**
      c) **Inside the conductor**
      d) **None**

   ii. **Total charge on outer surface is**
      a) **Q** c) **Q +q**
      b) **Q** d) **Q -q**

   iii. **The sensitive instrument is to be from the strong electrostatic fields in its environment after putting in this cavity.**
      a) **Broked** c) **Protected**
      b) **Leaked** d) **Away**

   iv. **Electric field inside a cavity is :**
      a) **Q/ r** c) **Zero**
      b) **q/r** d) **None**

4. An electric dipole is a system consisting of the two equal and opposite point charges separated by a small and finite distance. If dipole moment of this system is p and it is placed in a uniform electric field E .

i. What is the expression of torque experienced by a dipole?

a) E x P **c) p x F**

b) p x E **d) pE**

ii. Identify two pairs of perpendicular vectors in the above expression

a) Force is perpendicular to both p and E .

b) E is perpendicular to both F and p .

c) Torque is perpendicular to both E and p .

d) P is perpendicular to both torque and force .

iii. Which of the following orientation is for maximum torque ?

a) **c)**

E

b) **d)**

iv. Which of the following is a condition for stable equilibrium ?

a) p || E

b) p | E

c) Angle between p and E is 180 °

d) Angle between p and E is 30 °

5. In electrostatics, electric flux is the measure of the electric field through a given surface, although an electric field in itself cannot flow. It is a way of describing the electric field strength at any distance from the charge causing the field. Now, consider a cube of each edge 0.30 m is placed with its one corner at the origin. The cube is placed in a non-uniform electric field.

$E = (-2xi + 3j)$ N/C

Fig

i. The surface that have zero electric flux are

a) S_1 and S_2 **c) S_2 and S_4**

b) S_1 and S_6 **d) S_1 and S_3**

ii. Electric flux passing through surface S_1 is

a) $-0.27\ Nm^2C^{-1}$ **c) $-0.18\ Nm^2C^{-1}$**

b) $0.27\ Nm^2C^{-1}$ **d) $-0.18\ Nm^2C^{-1}$**

iii. Electric flux passing through surface S_4 is

a) $-0.18\ Nm^2C^{-1}$ **c) $+0.27\ Nm^2C^{-1}$**

b) $+0.18\ Nm^2C^{-1}$ **d) zero**

iv. Total net flux passing through the cube if E = 2i N/C

a) Zero **c) $0.18\ Nm^2C^{-1}$**

b) $-0.18\ Nm^2C^{-1}$ **d) $0.27\ Nm^2C^{-1}$**

v. Total charge enclosed inside the cube is

a) 0 **c)+1.62 pC**

b) -1.62 pC **d) 2.4 pC**

Biology

MCQ

1. Pollination in Lotus is:

(a) By water (b) By wind

(c) By insect (d) All of these

2. After fertilization ovule develops into: (a) Integument (b) Seed

(c) Embryo (d) Endosperm 3. Parthenogenesis is common in :

(a) Grape (b) Mango

(c) Citrus (d) Litchi

4. An orthotropous ovule is one in which micropyle and chalaza are :
(a) Oblique to funiculus
(b) At right angles to funiculus
(c) In a straight line with funiculus
(d) Parallel to funiculus
5. In an ovule meiotic takes place in:
(a) Nucellus (b) Megaspore mother cell
(c) Megaspore (d) Archesporium Read
6. Totipotency is
(a) Development of fruit from a flower in a medium
(b) Development of an organ from a cell in a medium
(c) Development of tissues of all kinds from a cell in a medium
(d) Development of tissues of all kinds from a cell in a medium
7. A typical angiospermic embryo sac is usually:
(a) One-celled (b) Two-celled
(c) Five-celled (d) seven-celled
8. If cotyledons are brought above the soil the germination is:
(a) Hypogeal (b) Epigeal
(c) Vivipaiy (d) None of these
9. In Monocots, grafting is almost impossible because they lack :
(a) Cambium (b) Ground tissue
(c) Vascular bundle (d) Parenchymatous cells
10. How many meiotic divisions are necessary to produce 100 pollen grains? (a) 100 (b) 50 (c) 25 (d) 20
11. Pollination by snails is called:
(a) Malecophily (b) Zoophily
(c) Anemophily (d) Hydrophily
12. When pollen tube enters into the nucellus through micropyle is called:
(a) Porogamy (b) Xenogamy
(c) Mesogamy (d) Dikogamy
13. Stalk of ovule is called :
(a) Funicle (b) Caruncle
(c) Nucellus (d) Pedicel
14. The function of the tapetum is to
(a) produce ubisch bodies
(b) produce pollen grains
(c) provide nourishment to the developing pollen grains
(d) store and protect pollen grains 15. Embryo sac is to ovule as _____ is to an anther
(a) Pollen grain (b) Androecium
(c) Filament (d) Stamen
16. In a breeding experiment, the selected male parent is diploid and the female parent is tetraploid. What will be the ploidy level of the endosperm that will develop after double fertilization?
(a) Pentaploid (b) Tetraploid
(c) Triploid (d) Diploid
17. When the pollen of a flower is transferred to the stigma of another flower on the same plant, the process is known as
(a) geitonogamy (b) autogamy
(c) Both (d) None of these
18. Wind pollination is common in
(a) Grasses (b) Lilies (c) Legumes (d) All of these
19. In an embryo sac, the cells that degenerate after fertilisation are
(a) Synergids and antipodals
(b) Synergids and antipodals
(c) Antipodals and primary endosperm cell (d) None of these
20. Which of the following floral parts forms the pericarp after fertilisation?
(a) Ovary wall (b) Inner integument
(c) Outer integument (d) All of these

Short Question:-
1. What is microsporogenesis?

2. Why is emasculation done in the process of hybridization?
3. What do you understand about double fertilization?
4. What is sporopollenin?
5. Why do most zygotes develop after a certain amount of embryo is formed?

PYQ (Long Question)

1.Continued self-pollination leads to inbreeding depression. List three devices, which flowering plants have developed to discourage self-pollination?
2.Differentiate between microsporogenesis and megasporogenesis. What type of cell division occurs during these events. Name the structure formed at the end of these two events.
3.Differentiate between microsporogenesis and megasporogenesis.
4. Explain the stages involved in the maturation of a microspore into a pollen grain.
5.What is triple fusion? Where does it occur?
6.Explain the structure of an anatropous ovule with a neat labeled diagram?
7.Describe the structure of a pollen grain.
8.Enlist the advantages offered by seeds to angiosperms.
9.Give any three advantages of sexual incompatibility.
10.Trace the development of microsporocytes into mature pollen grains.

Case Based
1.Pollen-pistil interaction is the group of events that occur from the time of pollen deposition over the stigma to the time of pollen tube entry into ovule. It is a dynamic process which has checks at several places for promotion or inhibition of pollen growth. Pollen-pistil interaction is a safety measure to ensure that illegitimate crossings do not occur. Compatibility and incompatibility of the pollen-pistil is determined by special proteins. The compatible pollens are able to absorb water and nutrients from the surface of the stigma. They germinate and produce pollen tubes. Pollen tubes grow into the style. Their growth and path through the style are also determined by specific chemicals.
Q1. Which of the following parts of gynoecium determines the compatible nature of pollen?
a. Stigma
b. Style
c. Ovary
d. Thalamus
Q 2. In Trifolium, which type of self-incompatibility is found?
a. Gametophytic Self-Incompatibility (GSI)
b. Sporophytic Self-Incompatibility (SSI)
c. Both GSI and SSI
d. None of the above
Q 3. Select the incorrect statement:
a. In Asteraceae, incompatibility is due to the genotype of the sporophytic stigmatic tissues.
b. In members of Brassicaceae, incompatibility is due to the genotype of the pollen.
c. Nature has imposed self-incompatibility to avoid highly homozygous individuals which have a very low survival value.
d. None of the above

2.Transfer of pollen grains (from anther) to the stigma of a pistil is termed pollination. Flowering plants have evolved an amazing array of adaptations to achieve pollination. They make use of external agents to achieve pollination. In Autogamy pollination is achieved within the same flower. Transfer of pollen grains from the anther to the stigma of the same flower. Geitonogamy is transfer of pollen grains from anther to stigma of another flower of the same plant. Xenogamy is transfer of pollen grains from anther to stigma of a different plant. Plants use two abiotic (wind and water) and one biotic (animals) agents to achieve pollination. Majority of plants use biotic agents for pollination. Only a small proportion of plants use abiotic agents.
Q. 1. Pollination between two flowers present on same plant is called _____
a) Geitonogamy
b) Xenogamy
c) Autogamy
d) Dichogamy
Q. 2. The type of pollination in dioecious plants is _____
a) Herkogamy

b) Autogamy
c) Geitonogamy
d) Xenogamy
Q. 3. In water hyacinth pollination takes place by _____
a) Water
b) Wind
c) Wind or Insects
d) Birds
Q. 4. Morphologically cross pollination but genetically self-pollination _____
a) Xenogamy
b) Geitonogamy
c) Autogamy
d) Cleistogamy

3.Artificial hybridisation is one of the major approaches of crop improvement programme. In such crossing experiments it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination (from unwanted pollen). This is achieved by emasculation and bagging techniques.
Q. 1. Removal of anthers from a bisexual flower is called _____
a) Emasculation
b) Selection
c) Bagging
d) Acclimatization
Q. 2. The events in artificial hybridization programmes which avoids unwanted cross pollination and self-pollination respectively-
I. Bagging
II. Emasculation
III. Rebagging
IV. Artificial cross pollination
a) I & II
b) II & 1
c) IV & ll
d) II & III
Q. 3. Bagging prevents _____
a) Desired self pollination
b) Undesired self pollination
c) Desired cross pollination
d) Undesired cross pollination
Q. 4. Which of the following is the correct sequence for artificial experiment in bisexual flowers?
a) Self-pollination -> Bagging -> Emasculation -> Rebagging
b) Cross pollination -> Bagging -> Emasculation -> Rebagging
c) Emasculation -> Bagging -> Cross pollination -> Rebagging
d) Bagging -> Emasculation -> Cross pollination -> Rebagging

4.In angiosperms, the pollen grains are being transferred from the anther to the stigma and is termed pollination. This phenomenon was first discovered by Camerarius (1694) in the end of seventeenth century. Pollen grains are immobile. They cannot reach the stigma by themselves. An external agent is required for this. The pollination is mainly of two types: self-pollination and cross-pollination.
Q 1. What do you mean by pollination?
Q 2. Who discovered pollination phenomenon?
Q 3. What is transferred between the plants in the process of pollination?
Q4. State 3 difference between the two types of pollination.

5.Embryo develops at the micropylar end of the embryo sac where the zygote is situated. Most zygotes divided only after certain amount of endosperm is formed. The early stages of embryo development are similar in both monocotyledons and dicotyledons. The zygote gives rise to the proembryo and subsequently to the globular heart-shaped and mature embryo. A typical dicotyledonous embryo consists of an embryonal axis and two cotyledons. Embryo of monocotyledons possess only one cotyledon.
(i) True embryo develops as a result of fusion of

(a) two polar nuclei of embryo sac
(b) an egg cell and a male gamete
(c) synergid and male gamete
(d) a male gamete and antipodals
(ii)Which of the given statements are true?
(i) During the development of a dicot embryo, heart-shaped embryo is followed by globular embryo.
(ii) The part of embryonal axis above the level of cotyledons is epicotyl, while the part below the level of cotyledons is hypocotyl.
(iii) Monocot seeds possess a single cotyledon represented by scutellum.
(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iii) (d) (i), (ii) and (iii)
(iii) Consider the following parts of an embryonal axis of a dicot seed.
(i) Hypocotyl (ii) Epicotyl (iii) Radicle (iv) Plumule
In which of the following the above parts are correctly arranged from top to base?
(a) (iii) → (i) → (ii) → (iv)
(b) (ii) → (i) → (iii) → (iv)
(c) (iv) → (ii) → (i) → (iii)
(d) (iii) → (iv) → (ii) → (i)
(iv) In grass family, the cotyledon is called
(a) epiblast (b) plumule
(c) scutellum (d) perisperm.

Assertion Reason
Mark the correct choice as:
(a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) If Assertion is true but Reason is false.
(d) If both Assertion and Reason are false.

Q.1. Assertion : Autogamy is a transfer of pollen grains from an anther to the stigma of the same flower on the same plant.
Reason : Xenogamy is pollination between two flowers on different plants.

Q.2. Assertion : Insects visit flower to gather honey.
Reason : Attraction of flowers prevents the insects from damaging other parts of the plant.

Q.3. Assertion : Pollen mother cells (PMCs) are the first male gametophytic cells.
Reason : Each PMC gives rise to two pollens.

Q.4. Assertion : Chasmogamous flowers require pollinating agents.
Reason : Cleistogamous flowers do not expose their sex organs.

Q.5. Assertion: Gynoecium consists of pistil.
Reason: It represents the male reproductive part in flowering plants.

Q.6. Assertion: Flowers are the structures related to sexual reproduction in flowering plants.
Reason: Various embryological processes of plants occur in a flower.

Q.7. Assertion: Geitonogamy is genetically similar to autogamy.
Reason: The pollen grains come from same plant.

Q.8. Assertion: Cleistogamous flowers produce assured seed set in the absence of pollinators.
Reason: These flowers do not open at all.

Q.9. Assertion: A typical microsporangium of angiosperms is generally surrounded by four wall layers.
Reason: The outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen.

Q.10. Assertion: Exine of a pollen grain is made up of sporopollenins which are resistant to high temperatures, strong acids or alkali as well as enzymatic degradation.
Reason: Sporopollenins are absent in the region of germ pores.

PPT- Make A PPT on Angiosperm and Gymnosperm of Flowering Plants.

12TH ACCOUNTANCY

MCQ s -

1. Find out 20 MCQs [One word answer type] with answers from the chapters taught.[Each from Chapters – 1 2 and 3 from book 1].

Guarantee of Profit

SHORT ANSWER TYPE QUESTIONS

1. Ram, Mohan and Sohan are partners with capitals of Rs.5,00,000, Rs.2,50,000 and 2,00,000 respectively. After providing interest on capital @10% p.a. the profits are divisible as follows:
Ram 1⁄2, Mohan 1/3 and Sohan 1/6. Ram and Mohan have guaranteed that Sohan's share in the profit shall not be less than Rs.25,000, in any year. The net profit for the year ended March 31, 2016 is Rs.2,00,000, before charging interest on capital.
You are required to show distribution of profit.
(Ans: Profit to Ram, Rs.48,000, Mohan, Rs.32,000 and Sohan, Rs.25,000)

Past Adjustment

2. The net profit of X, Y and Z for the year ended March 31, 2006 was Rs.60,000 and the same was distributed among them in their agreed ratio of 3:1:1. It was subsequently discovered that the under mentioned transactions were not recorded in the books:
(i) Interest on Capital @5% p.a.
(ii) Interest on drawings amounting to X Rs.700, Y Rs.500 andZRs.300.
(iii) Partner's Salary: X Rs.1000, YRs.1500p.a.
The capital accounts of partners were fixed as: X Rs.1,00,000, Y Rs.80,000 and Z Rs.60,000. Record the adjustment entry.
(Ans: X Dr. Rs.2,700, Y credit Rs.2,600 and Z credit Rs.100]

Valuation of Goodwill

3. Compute the value of goodwill on the basis of four years' purchase of the average profits based on the last five years? The profits/losses for the last five years were as follows:
2012 – Rs 25,000; 2013 - Rs40,000; 2014 - (Rs15,000) loss; 2015 - Rs80,000; 2016 - Rs1,00,000
Ans: Rs 1,84,000
4. Capital employed in a business is Rs.2,00,000. The normal rate of return on capital employed is 15%. During the year 2002 the firm earned a profit of Rs.48,000. Calculate good will on the basis of 3 years purchase of super profit?
(Ans: Rs.54,000)
5. A business has earned average profits of Rs.1,00,000 during the last few years. Find out the value of goodwill by capitalisation method, given that the assets of the business are Rs.10,00,000 and its external liabilities are Rs.1,80,000. The normal rate of return is 10%?
(Ans: Rs.1,80,000)
6.What is " Hidden Good will'. How the amount of hidden goodwill calculated?

7.Why there is a need for revaluation as assets and liabilities on the admission of a Partner?

8.How will you deal with accumulated profits and losses ,reserves on the admission of a new partner?
9. A&B are partners in the firm sharing profits and losses in 3:2 ratio, they are doing the business of recycling the old furniture and refurnishing them for sale. On 1st April,2019 they admit C as a new Partner for 1/8th Share. The new profit-sharing ratio between A&B is 4:3,
Calculate the new profit sharing ratio and sacrificing ratio

10. Explain the estimation of profits upto the date of retirement on the basis of time period insolvent?
11. P,Q and R partners sharing profits in the ratio 7:5:3,P retires and it is decided that profit sharing ratio

between Q and R will be same as existing between P and Q . Calculate new profit sharing ratio and gaining ratio.
12. N, M and T were partners in a firm, On 1st Jan 2019 M retired . On M's retirement goodwill of the firm was valued at Rs 420000, Pass necessary entries.

13.Naresh, Raj and Biswajit are equal partners, Raj decided to retire, on the date of his retirement, the Balance sheet of the firm showed the following General reserve 36000,Profit/loss A/c (Dr)15000
Pass necessary journal entries

LONG ANSWER TYPE QUESTIONS [PYQs]

Division of Profit

1. X and Y are partners with capitals of Rs.15,00,000 and Rs.10,00,000 respectively. They agree to share profits in the ratio of 3:2. Show how the following transactions will be recorded in the P & L Appropriation and capital accounts of the partners in case:
(i) The capitals are fixed, and
(ii) The capitals are fluctuating. The books are closed on March 31, every year.
Particulars X (Rs.) Y (Rs.)
Additional capital contributed on July1,2015 3,00,000 2.00,000
Interest on capital 5% 5%
Drawings (during 2015-16) 30,000 20,000
Interest on drawings 12% 12%
Salary 20.000 –
Commission 10,000 7,000
The profits for the year ending 31st March, 2016 were Rs 71,500.
Hint: If the capitals are fixed: X's capital A/c-Rs 18,00,000; Y's capital A/c-Rs 12,00,000
X's current A/c-Rs 20,700; Y's current A/c-Rs 80.
If the capitals are fluctuating: X's capital A/c-Rs 18,20,700; Y's capital A/c-Rs 12,00,800
Interest on Capital & Interest on Drawings
2. A and B are partners sharing profits and losses in the ratio of 3:2. Their capital accounts showed balances of Rs.1,50,000 and Rs. 2,00,000 respectively on Jan 01, 2003.
Show the treatment of interest on capital for the year ending December 31, 2006 in each of the following alternatives:
A)If the partnership deed is silent as to the payment of interest on capital and the profit for the year is Rs.50,000;
B)If partnership deed provides for interest on capital @8% p.a. and the firm incurred a loss of Rs.10,000 during the year;
(a) If partnership deed provides for interest on capital @8% p.a. and the firm earned a profit of Rs.50,000 during the year;
(b) If the partnership deed provides for interest on capital @8% p.a. and the firm earned a Profit of Rs.14,000 during the year.
Hint: In the absence of any information interest on capitals will be appropriation of profit1. Calculate new and Sacrificing ratio in the following cases
a. L and M are partners sharing in the ratio of 5:3 N, New partner gets1/5th of L's Share and 1/3rd of M's share.
b. L and M were share profit and losses in the ratio of 5:3, L surrenders 1/20th of his share, whereas M surrenders 1/24th of his share in favor of N, the new partner.
c. L and m were shar8ing in the ratio of 3:2 N is admitted as a new partner L surrenders 1/3rd of his share and M surrenders 1/4th of his share.

3. An extract of the balance sheet of Ram and Sam, who share profits in the ratio of 2:3 is given below liabilities Amount ₹ Assets Amount ₹
Workman Compensation Reserve

liabilities	Amount ₹	Assets	Amount ₹
Workman Compensation Reserve	80,000		

Give the accounting treatment at the time of Deepa's admission
a. When no information is given
b. when claim on account of workmen compensation is estimated at ₹65,000
c. when claim on account of workmen compensation is estimated at ₹ 1,00,000
d. when claim on account of workmen compensation is estimated at ₹ 80,000
The new profit-sharing ratio is 1:1:1

3. Krishna and Suresh were partners in a firm sharing profits in the ratio of 3:1. On 1st April 2019, they admitted Rahul as a new partner for 1/5th share in profits of the firm. On the date of Rahul's admission the balance sheet of Krishna and Suresh showed a general reserve of ₹ 120000 a debit balance and ₹ 60000 in profit and loss account and workmen compensation fund of ₹150000.
The following was agreed upon on Rahul's admission
a. Rahul will bring ₹ 150000 as his capital and his share of goodwill premium in cash
b. Goodwill of the firm be valued at ₹170000
c. The partners decided to share future profits in the ratio of 3:1:1
d. Goodwill of the firm be valued at ₹ 240000
Pass necessary journal entries for the above on Rahul's admission

4. L,M,N were partners in a firm sharing profits I n the ratio of 3:2:1 . Their balance sheet as at 31st March,2019 was as follows

Liabilities	**Amount ₹**	**Assets**	**Amount ₹**
Creditors	168000	Bank	34000
General Reserve	42000	Debtors	46000
Capital A/c		Stock	220000
L 120000		Investments	60000
M 80000		Furniture	20000
N 40000	240000	Machinery	70000
Total	**450000**	**Total**	**450000**

On the above date O and the was admitted as a new partner and it was decided that
a. The new profits sharing ratio between L,M,N and O will be 2:2:1:1
b. Goodwill of the firm was valued at ₹180000 and o brought his share of goodwill premium in cash
c. The market value of investments was ₹36000
d. Machinery s will be reduced to ₹58000
e. A creditor of₹ 6000 was not likely to claim the amount and hence was to be written off
f. O will bring proportionate capital so as to give him 1/6th Share in the profits of the firm
Prepare Revaluation account, partners' capital accounts and balance sheet of the new firm.

1. A, B and C are partners sharing profits int the ratio of their capitals, B retired from the firm on 31.03.2019,the date on which the balance sheet of the firm as under

liabilities	Amount	Assets	Amount
Sundry creditors	24000	cash	32400
Bill payable	18000	Debtors 36000	
Capitals		Less-Provision 2400	33600
A 180000		stock	60000
B 144000		Fixed assets	348000
C 108000	432000		
	474000		**474000**

The following adjustments were made
a. Fixed assets appeared by 20%
b. Stock depreciated by 20%

c. Goodwill of the firm be valued at 72000 and b's share will be adjusted into the capital accounts of A & C without opening goodwill account
d. New profit sharing ratio of A&C is decided to be 3:2

2.H,G and N are partners sharing profits and losses in the ratio of 3:2;1,on 31st march,2019
Naman retires
The various assets and liabilities of the firm on the date were as follows
Cash Rs 10000,Building 100000,Plant&Machionery 40000,stock 20000,debtors 20000 and investment 30000
The following was agreed upon between the partners on N retirement
a. Building to be appreciated by 20%
b. Plant & Machinery to be depreciated by 10%
c. A provision of 5% on debtors to be created for bad and doubtful debts
d. Stock was to be valued at Rs 18000 and investment at Rs 35000
Record the necessary journal entries to the above effect and prepare the revaluation account.

3. Sangeeta, Saroj and shanti are partners sharing profits and losses in the ratio of 5:3:2
Shanti retired and on the date of her retirement, following adjustments were agreed
a. The value of furniture is to be increased by 12000
b. The value of stock is to be increased by 10000
c. Machinery of the book value of 50000 is to be reduced by 10%
d. A provision for doubtful debts @5% is to be created on debtors of book value of 40000
e. unrecorded investment worth 10000
f. An item of 1000 included in bills payable is not likely to be claimed, hence should be written back
pass necessary journal entries.
4. Asha, Naveen and shanti were partners in a firm sharing profits in the ratio of 5:3:2
Goodwill appeared in their books at a value of 80000 and General reserve at 40000
Naveen decided to retire from the firm, On the date of his retirement, goodwill of the
Firm was valued at 120000 . The new profit sharing ratio decided among Asha and Shalini is 2:3
Record necessary journal entries on Naveen's retirement

PREPARE A PPT ON THE GIVEN CHAPTER –
Fundamental of partnership

B.St.

1. Traditional
   MCQs
   i) Which is not a separate function of management?
   a) Staffing b) Planning c) Cooperating d) Controlling
   ii)According to the nature of management, Management can be considered as:
   a) Neither science nor art b) art c) science d) both art and science
   iii) Which is not an organizational/economic objective of management out of the following?
   a) Survival of the organisation b) growth of the organisation c) Providing employment d) earning profits
   iv) Policy formulation is the function of:
   a). Operational managers b) All of these c) Top level managers d) Middle level managers
   v) Coordination can be considered as:
   a) an objective of management b) a goal of management c) a function of management d) an essence of management
   vi) a good manager synchronises all the activities of different departments through the process:
   a) Coordination b) Planning c) Staffing d) Supervision

vii) Efficiency is concerned with:

a) Utilisation of minimum resources b) Cooperation

c) Right man at right job d) Completion of task

viii) Middle level management consists of :

a) President b) Finance Manager c) Supervisor d) Chairman

ix) Who is responsible for the welfare and survival of an organization?

a) Floor level management b) Operational Management c) Top level Management d) Middle level Management

x) What type of force management is?

a) visible b) Invisible c) Both of these d) None of these

xi) Which nature is not present in Principles of management?

a) Flexible b) Behavioural c) Universal d) Absolute

xii) How are principles of management formed?

a) By experiences of managers b) By experiences of customers c) By propagation of social scientists d) in a laboratory

xiii) The principles of management are significant because of :

a) Optimum utilization of resources b) Meeting changing environment requirements c) All of these d) Scientific decisions

xiv) Henry Fayol was a:

a) Accountant b) Production engineer c) Social scientist d) Mining engineer

xv) Which statement is related to the principle of division of work?

a) Resources should be divided among jobs b) Labour should be divided c) Departments should be divided into sub sections d) Work should be divided into small tasks

xxi) She/he keeps machines, materials, tools, etc., ready for operations by concerned workers. Whose work is described by this sentence under functional foremanship?

a) Gang boss b) Repair boss c) Route clerk d) Instruction card clerk

xvii) Which of the following is not a Principle of management given by Taylor?

a) Harmony, not discord b) Functional Foremanship c) Cooperation, not individualism d) Science, not rule of the thumb

xviii) Management should find one best way to perform a task. Which technique of scientific management is defined in the sentence?

a) Method study b) Fatigue study c) Motion study d) Time study

xix) Which of the following statements best describes Mental Revolution?

a) Both management and workers require each other.

b) The management- and workers should not play the game of one upmanship

c) It implies a change of attitude of management only.

d) Workers should be paid more wages.

xx) Who is considered as father of Scientific Management?

a) Henry Fayol b) Gilbreth c) F.W Taylor d) Harold Koontz

Short Questions

i)How does coordination ensure unity of action in management?

ii) Explain why management is not a pure science.

iii) Why is management considered to be a multi-dimensional concept?

iv) Name and explain the principle of management in which workers should be encouraged to develop and carry out their plans for improvement in the organization.

v) What do you mean by management principles?

Long Answer Questions

i)Coordination is the essence of management. Do you agree? Give reasons.

ii) a successful enterprise has to achieve its goals effectively and efficiently. Explain.

iii) Management is a series of continuous interrelated functions. Comment.

iv) A company wants to modify its existing product in the market due to decreasing sales. You can imagine any product about which you are familiar .What decisions /steps should each level of management take to give effect to this decision?

v) Do you think management has the characteristics of a full-fledged profession?

vi) Define scientific management and explain its principles.

vii) Taylor's principles of scientific management and Fayol's principles of management are mutually complementary. Do you agree with this view ?Give any four reasons in support of your answer.

vii) Explain the principle of Centralisation and Decentralisation.

viii) Name and explain that principle of Fayol which suggests that communication from top to bottom should follow the official lines of command.

ix) Explain the technique of Functional Foremanship and the concept of Mental Revolutions enunciated by Taylor.

x) Explain the following principles of management:

a) Subordination of individual interest to General interest

b) Development of each and every person to his or her greatest efficiency.

2.Students will form team of two and thereby prepare PPT either on the topic" Nature and Significance of Management" or" Principles of Management".

3.Choose the correct options from the following for Q.No (i) to(v)

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

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

c) A is true but R is false.

d) A is false but R is true

i) Assertion: One of the major contributions of FW Taylor is the Piece Rate System.

Reason: He has also published various books and research papers on Industrial Organisation and Management.

ii) Assertion: Unity of command means one unit one plan.

Reason: The Principle of unity of Command reduces the chances of ego clashes among superiors and leads to more effective working.

iii) Assertion: Coordination emphasizes unifying the efforts of different individuals.

Reason: Conflicting efforts may cause damage to the organization.

iv) Assertion: Efficiency aims at performing tasks with the least wastage of time and effort

Reason: Efficiency is about doing the job in a cost-effective manner, i.e., getting maximum output with minimum input.

v) Assertion: Management is called an exact science.

Reason: Management deals with complex human behaviour , which cannot be determined with accuracy.

Case based questions

i) Ashutosh Goenka was working in Axe Ltd., a company manufacturing air purifier. He found that the profits has started declining from the last six months. Profit has an implication for the survival of the form, so he analysed the business environment to find out the reasons for this decline.

a) Identify the level of management at which Ashutosh Goenka was working.

b) State three other functions being performed by Ashutosh Goenka.

ii) Nayonika Ltd.is running successfully from the last five years in Noida. Its management has decided to focus on states of South India as well as to sell its products. What is the organizational objective Nayonika Ltd.is trying to achieve?

iii) Hritik is desirous of setting up a small factory to manufacture different kinds of eco-friendly packaging materials. He proposes to adopt a logical approach to his business rather than hit and trial method as he knows that this can result in tremendous saving of human energy as well as wastage of time and materials. He plans to adopt paternalistic style of management in practice in order to avoid any kind f class conflict that may emerge between him and the workers. Moreover, he plans to seek the opinion of his workers before taking any important decisions and also offers incentives to them for providing valuable suggestions for the business.

In context of the above case:

a) Identify and explain the various principle of scientific management that Hritik plans to apply in his business.

b) List any two values that he wants to communicate to the society by offering eco-friendly packaging material.

iv)" Study Buddy Pvt. Ltd." is company dealing in stationery items. In order to establish standards of excellence and quality in materials and in the performance of men and machines , the company adheres to benchmarks during production. Moreover, its products are available in limited varieties, sizes and dimensions thereby eliminating superfluous diversity of products.

Identify the technique of scientific management which has been adopted by" Study Buddy Pvt Ltd. "Also explain.

Economics

1.Find out any 25 MCQ from Chapter 1 [Macro Economics and Indian Economy

2. Prepare a PPt on the methods of measuring National Income.

3.Assertion and Reason-

Choose the correct answer out of the following choices.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A),
(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A),
(c) Assertion (A) is true but Reason (R) is false
(d) Assertion (A) is false but Reason (R) is true.

A

1. Assertion (A): Microeconomics is the study of an individual unit of a commodity
Reason(R): - The basic tools of microeconomics are demand and supply

2. Assertion (A): - Stationary purchased in a school is an intermediate good
Reason(R): - Intermediate goods once used in production lose their utility.

3. Assertion (A): - If the GDP of a country is rising the welfare may not rise as a consequence.
Reason(R): - The rise in GDP may be concentrated in the hands of very few individuals.

4. Assertion (A): - Domestic Income is less than National Income, when NFIA is negative
Reason(R): - National Income is transfer Income

5. Assertion (A): - Real GDP is better index of economic growth than the nominal GDP
Reason(R): - The Index of Real GDP always reflects a change in the level of output.

B.

1. Read the following statements-Assertion (A) and Reason (R). Choose one of the correct alternatives given below:
Alternatives:
a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).
c) Assertion (A) is true but Reason (R) is false.
d) Assertion (A) is false but Reason (R) is true.

1.Assertion (A): The economic policies pursued by the British colonial transformed India into supplier of raw materials and consumer of finished industrial products from Britain.
Reason (R): The economic policies of the British colonial government were concerned more with the protection and promotion of the economic interests of their home country than with the development of the Indian economy.

2.Assertion (A): India could not develop a sound industrial base during the British rule.
Reason (R): British followed restrictive trade policies, which led to the rise of Indian handicraft industries.

3.Assertion (A): Agricultural productivity became low during British rule in India.
Reason (R): The productivity was low mainly due to various systems of land settlement introduced by the colonial government.

4.Assertion (A): The colonial government never made any sincere attempt to estimate India's national and per capita income.
Reason (R): Growth of aggregate real output during the first half of the twentieth century was less than two per cent.

5. Assertion (A): More than half of India's Foreign trade was restricted to Britain.
Reason (R): Britain maintained Monopoly control on India's imports and exports.

4. Short Answer Type Question/Answer-

1.Define National Income ,Gross Domestic Product (GDP).factor incomes, transfer payments.
2.Define 'Nominal GNP' 'Real GNP'.
3.Define final product or final goods and Intermediate goods.
4.Define depreciation or consumption of fixed capital formation
5.What do you mean by domestic territory and Normal Residents?
6. What do you mean by export surplus? How was it generated during British period? what was its effect on Indian economy?
7. "The pre-independent India's occupational structure experienced growing regional variation." Justify the above statement with valid explanation.
8. "During the colonial period, a number of socio-economic indicators were in a dilapidated state." List any three such indicators that led to the worsening of India's demographic profile.
9. What was the main focus of the economic policies undertaken by the British government in India? What were the impacts of these policies?
10. Mention the advantages india got from the British Rule.

5.Long Answer Type Questions –
1 Describe the Methods of calculating National Income with examples .
2. Describe Income folw with the help of suitable diagrams [Two Sectors , Three Sectors and Four Sectors]
3. Find out national Income by all the three methods . [2 questions from each method]
4. Highlight the salient features of India's pre-independence occupational structure.
5. What were the main causes of India's agricultural stagnation during the colonial period?

History

1. Find any 25 MCQs each from chapter 1 and chapter 2 [Theme I]
2. Prepare a PPT on "Bricks beads and Bones" [Theme I Chapter I]

3.ASSERTION/REASION
Directions: In the following questions given below, there are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the correct option:
a. Both (A) and (R) are true and (R) is the correct explanation of (A).
b. Both (A) and (R) are true, but (R) is not the correct explanation of (A).
c. (A) is true, but (R) is false.
d. (A) is false, but (R) is true.

1. Assertion (A): Between 6th and 4th centuries BCE, Magadha became the most powerful Mahajanapada.
Reason (R): Magadha had agricultural productive area, Iron mines and vast forest area.

2. Assertion (A): Historians use a variety of sources to understand developments over the ages.
Reason (R): These sources include inscription, texts, coins, sculptures and other visual materials.

3. Assertion (A): Ashoka inscribed his messages to his subjects and officials on stone surfaces.
Reason (R): He used it as a means of communicating with his people to spread the message of Dhamma.

4. Assertion (A): The Harappan culture is named after the first site where this culture was discovered. Reason (R): Alexander Cunningham announced the discovery of this culture to the world in 1924.

5. Assertion: Archaeologists and historians find Harappan script enigmatic.
Reason: The Harappan script remained undeciphered till date.

6. Assertion (A): Early archaeologists thought that certain objects may had a religious significance.
Reason (R): Attempts have been made to reconstruct religious beliefs and practices by examining seals, some of which seems to depict ritual scenes.

7. Assertion (A): Most Mahajan padas were ruled by kings
Reason (R): Each Mahajan pada had a capital city.

8. Assertion (A): Indian cities were very prosperous.
Reason (R): Indian cities were densely populated.

9. Assertion (A): The Crips Mission was failed to reach an agreement with Indian leaders
Reason (R): The Quit India Movement was started in 1942

10. Assertion (A): The Santhals were given land and persuaded to settle in the rocky upper part of Rajmahal Hills.
Reason (R): The British perceived Paharias and Santhals as ideal settlers

4.SHORT ANSWER TYPE -

1. How did architectural features of Mohenjodaro indicate planning? Support the statement with examples. Delhi 2014
2. "The archaeological records provide no immediate answer to the central authority in Harappan society". Analyse different views given in the same. (HOTS; Delhi 2013)
3. What are the aspects of Harappan economy that have been reconstructed from archaeological evidence? (All India 2013)
4. What are the evidences found by the archaeologists which show that the Harappans had contacts with distant lands? Does it show that the contact proved to have good trade relations with each other. (All India 2011)
5. What factors in your opinion are responsible for the collapse of a mature Harappan Civilisation by 1800 BCE? (HOTS; All India 2009)
6. Describe the contribution of John Marshall, Director General of the ASI to Indian archaeology, (All India 2009)
7. Explain briefly the distinctive features of Harappan drainage system. (Delhi 2008)
8. How did Magadha became the most powerful mahajanapada between 6th and 4th century BCE? Give two reasons.
(All India 2014)
9. Explain why the communication along both land and riverine routes was vital for the existence of the empire during the period of Mauryan. (Compartment 2013)
10. Critically examine the limitations of the inscriptional evidence in understanding political and economic history of India. (Delhi 2015)

5. LONG ANSWER TYPE QUESTIONS -

1. Why was the Mauryan empire regarded as a major landmark in early Indian history? (Delhi2015)
2. Why is the 6th century BCE often regarded as a major turning point in early Indian history.(Delhi 2015)
3. Why is James Prinsep's contribution considered as the historic development in the Indian epigraphy? (HOTS; Delhi 2015)
4. How were the coins used in the 1st century CE? Give two examples. (All India 2015)
5. How did Kushana rulers exemplify themselves with the high status? (All India 2015)

6. LOCATE THE FOLLOWING ON AN OUTLINE MAP OF INDIA –
A.
1. Harappa, 2.Banawali, 3.Kalibangan, 4.Balakot, 5.Rakhigarhi, 6.Dholavira, 7.Nageshwar, 8.Lothal, 9.Mohenjodaro, 10.Chanhudaro
B.
1. Vajji, 2.Magadha, 3.Kosala, 4.Kuru, 5.Panchala, 6.Gandhara, 7.Avanti, 8.Rajgir, 9.Ujjain, 10.Taxila, 11.Varanasi. 12.Sanchi, 13.Topra, 14.Meerut Pillar 15.Kaushambi.

Geography

MCQ s -
1. Find out 20 MCQs [One word answer type] with answers from the chapters taught.[Each from Chapters – 1 and 2 from book 1 and book 2].

SHORT ANSWER TYPE QUESTIONS
1. Define Human Geography. How is human geography related to other social sciences?
2. What do you mean by 'Dualism in Geography? State some examples of metaphors used to describe the physical and human phenomena.
3. "There is no free run without accidents." Explain.
4. Explain any three push and any two pull factors that influence the migrations of in the world. OR
How is the mortality rate of a region affected? Explain any four push factors responsible for migration.
5. Mention the different techniques to measure the population Density. What is the Difference between Physiological Density and Agricultural Density?
6. Which are the three groups of Indian population[workers] according to their economic status? Explain the main characteristics of each group.
7. Classify Indian towns on the basis of their evolution in 3 different periods. Name any town of each period.
8. What are main characteristics of Rural Clustered Settlements of India?

9. Classification of India`s Towns on the basis of Population Size by Census .
10. Classify the India`s towns and cities on the basis of its functions performed.

LONG ANSWER TYPE QUESTIONS [PYQs]

1. Explain the concept of 'Neo Determinism' with suitable examples. OR
What is the new concept of Griffith Taylor in the field of human geography? Describe the concept with examples.
2. Describe any three characteristics of the first stage of 'Demographic Transition Theory'.
3. Describe the uneven patterns of population distribution in the world.
4. What is human development? Analyse the four pillars of human development.
5. "The decades 1951-81 are referred to as the period of population explosion in India." Explain the statement by giving three reasons,

POWERT POINT PRESENT ATION –

1. Prepare a PPT on Human Development / Settlement [Minimum 20 slides]

Assertion – Reason

1. Consider the following statements, try to establish cause and effect relationship between these two and choose the correct option for the same.
AIt is technology that has allowed the people of Trondheim and others to overcome the constraints imposed by nature.
B. A geographer, Griffith Taylor introduced another concept which reflects a middle path (Madhyam Marg) between the two ideas of environmental determinism and possibilism. He termed it as Neo determinism or stop and go determinism.
Options;
(A) Only statement I is true.
(B) Only statement II is true
(C) Both I and II statements are correct and the statement II correctly explains the statement I.
(D) Both I and II statements are correct but not related to each other.

2. Assertion-Geography as a field of study is integrative, empirical, and practical.
Reason-The reach of geography is extensive and each and every event or phenomenon which varies over space and time can be studied geographically.
Options;
(A) Only statement I is true.
(B) Only statement II is true
(C) Both I and II statements are correct and the statement II correctly explains the statement I.
(D) Both I and II statements are irrelevant.

3. Assertion(A): Population of a region does not change.
Reason(R): Birth rate, Death rate and migration affect the population of a region.
(a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
(b) Both Assertion and reason are correct but Reason is not the correct explanation for Assertion.
(c) Only Assertion is correct.
(d) Only Reason is correct.

4. Assertion (A): The people of a country are its real wealth.
Reason (R): It is they, who are the actual resources and make use of the country's other resources and decide its policies.
(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.

5.Assertion (A): Efforts should be made to increase people's knowledge, provide better health facilities ultimately leading to better work efficiency.
Reason (R): It is people who are the real wealth of nations
(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

6. Assertion (A): Sri Lanka and Tobago have higher rank in human development index than India.
Reason (R): Economy of Sri Lanka and Tobago is larger than the economy of India.
(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

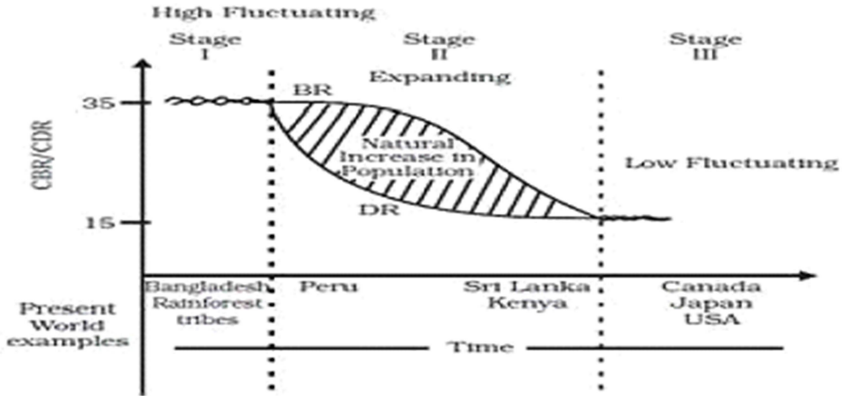
7. Assertion (A): Clustered village is a universal feature in the northern plains.
Reason (R): Clustered villages are found in areas of level and fertile land. Major portion of the population is landless; hence they are bound to live together
(A) Both A and R are true and R is the correct explanation 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

8. Assertion (A): Clustered village is a universal feature in the northern plains.
Reason (R): Clustered villages are found in areas of level and fertile land. Major portion of the population is landless; hence they are bound to live together
(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

9. Assertion (A): The decades 1921-1951 are referred to as the period of steady population growth.
Reason(R): Improvement in health and sanitation brought down the mortality rate.
(A) Both Assertion and reason are true and reason is correct explanation of assertion.
(B) Assertion and reason both are true but reason is not the correct explanation of assertion.
(C) Assertion is true, reason is false.
(D) Assertion is false, reason is true.

10. Assertion (A): The people are very important component of a country.
Reason (R): A large population invariably puts pressure on its limited resources and is also responsible for many socio- economic problems in the country.
(A) Both Assertion and reason are true and reason is correct explanation of assertion.
(B) Assertion and reason both are true but reason is not the correct explanation of assertion.
(C) Assertion is true, reason is false.
(D) Assertion is false, reason is true.

Graph / Data based Questions -
1.



1. How does the natural increase in population occur, as per the graph?

a. Birth Rate – Death Rate

b. Death Rate + Birth Rate

c. Growth Rate - Birth Rate

d. Birth Rate + Migration

2. What does the transition from high fluctuating stage to low fluctuating stage indicate?

a. Shift from Urban Industrial economy to Rural Agrarian economy

b. Shift from Rural Agrarian economy to Urban Industrial economy

c. Low Birth and Death Rate to High Birth and Death Rate

d. Migration from Urban to Rural areas

3. From the given graph, what condition can you infer about the least developed countries?

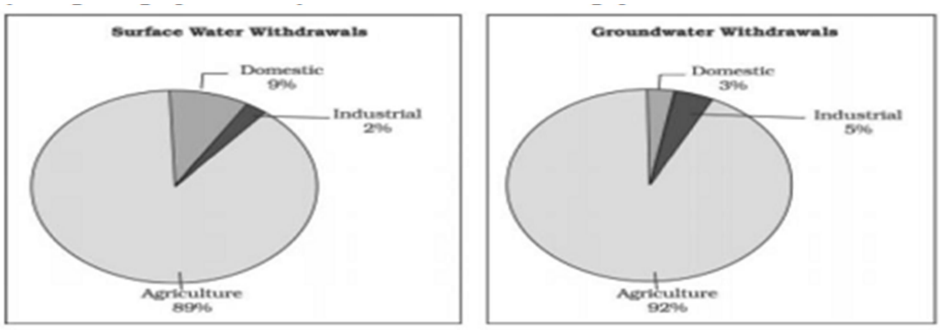
a. High Birth Rate and High Death Rate

b. Low Birth rate and Low Death rate

c. High Birth Rate and Low Death Rate

d. Low Birth Rate and High Death Rate

2. Study the given graph carefully and answer the following questions:-



i. In which of the following sectors the use of surface water is maximum?
a. Domestic
b. Industrial
c. Agriculture
d. None of the above

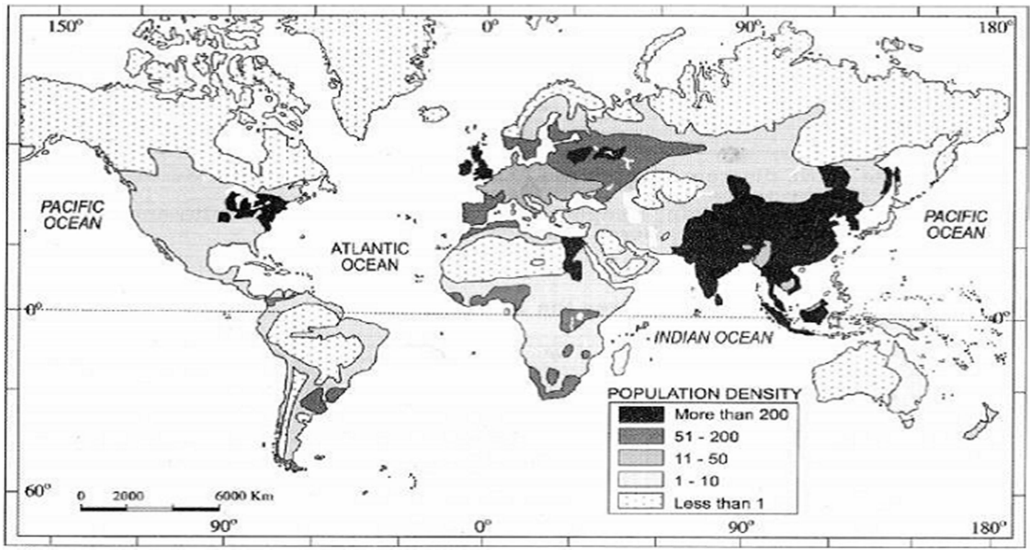
ii. Choose the correct sequence of the following sectors in ascending order regarding the percentage usage of ground water.
a. Agricultural use – Industrial use – Domestic use
b. Domestic use – Industrial use – Agricultural use
c. Industrial use – Agricultural use - Domestic use
d. Agricultural use – Domestic use – Industrial use

iii. Which of the following is not a reason for the high dependency of agriculture on groundwater and surface water irrigation in India?
a. Lack of rainfall from the south-west monsoon
b. Seasonality of rainfall
c. Commercialization of agriculture over the years
d. Green revolution resulted in the use of HYV seeds, which require more water

3. On the given map of the world, identify any five countries of primary activities –

4. Locate the following on the given map of India -
The State having the highest rank in the Human Development Index
The State having highest population density (2011)
The leading groundnut producer State
A centre of cotton textile industry in Karnataka
A Major Jute producing state

5. Study the given map and answer the following questions:
(i) Name the nations having high density of population in Asia. (ii) Name the nations having less than one person of population density. (iii) Give appropriate reasons for the above two questions.



Political Science

MCQ s -

Find out 20 MCQs [One word answer type] with answers from Chapters – 1 and 2 [from book 1 and book 2].

ASSERTION - REASON -

Options:
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

1. Assertion (A): The partition of India in 1947 led to massive communal violence and displacement.
Reason (R):The British policy of 'Divide and Rule' and the failure of political leaders to reach a consensus aggravated religious tensions.

2. Assertion (A): Integrating princely states into the Indian Union was a major challenge after independence.
Reason (R): Some princely states like Hyderabad and Junagadh resisted joining India initially.

3. Assertion (A): Linguistic reorganization of states was necessary for administrative efficiency.
Reason (R):The States Reorganization Act (1956) was passed to create states based on language.

4.Assertion (A): The economic development of India after independence was uneven.
Reason (R): The British colonial policies had left India with a weak industrial base and widespread poverty.

5. Assertion (A):The adoption of a democratic system was a challenge for India after independence.
Reason (R): India had no prior experience of democratic governance before 1947.

6.Assertion (A): The Soviet Union collapsed in 1991 due to economic stagnation and political reforms.
Reason (R): Gorbachev's policies of Perestroika and Glasnost weakened the Communist Party's control.

7.Assertion (A): The end of the Cold War marked the disintegration of the bipolar world order.**
Reason (R): The Warsaw Pact dissolved, and Eastern European countries shifted away from Soviet influence.
8.Assertion (A):* The arms race between the US and USSR contributed to the Soviet Union's economic crisis.**
Reason (R): The Soviet Union spent heavily on military technology, neglecting domestic development.

9.Assertion (A): The fall of the Berlin Wall (1989) symbolized the decline of Soviet dominance in Eastern Europe.
Reason (R): East Germany merged with West Germany, leading to German reunification.

10.Assertion (A): The Commonwealth of Independent States (CIS) was formed after the USSR's dissolution.
Reason (R):Former Soviet republics wanted to maintain economic and military cooperation.

POWERT POINT PRESENT ATION –

Prepare a PPT either on chapter 1 or chapter 2.

1. Prepare a PPT on Human Development / Settlement [Minimum 20 slides]

Short Answer Questions (6 – 8 lines each)

1. What is nation-building?

2. Why is national integration a challenge in nation-building?
.
3. How does economic inequality affect nation-building?

4. What role does political instability play in nation-building?

5. Why is education important in nation-building?

6. What was the immediate cause of the disintegration of the Soviet Union?

7. What was the significance of the ‘Shock Therapy’ in post-Soviet Russia?

8. How did Gorbachev’s reforms contribute to the end of bipolarity?

9. Why did the Warsaw Pact dissolve in 1991?

10. What role did Boris Yeltsin play in the end of the Soviet Union?

Long Answer Questions (15-20 lines each)

1. Discuss the major challenges faced in nation-building after independence in post-colonial countries.

2. Explain how social divisions (ethnicity, religion, caste) create obstacles in nation-building.

3. Analyze the role of leadership and governance in successful nation-building.

4. Explain the factors that led to the disintegration of the Soviet Union.

5. Discuss the consequences of the end of bipolarity on global politics.

PICTURE BASED QUESTIONS -

1. Picture: Map of India during Partition (1947) with mass migration scenes*
Question: What challenge of nation-building does this image represent?

2. Identify the event in the picture and its significance.
(Image: Berlin Wall being torn down in 1989.)

3. What does this political cartoon signify?
(Cartoon: USSR breaking into pieces labeled as different republics.)

4. Identify the event in the picture and its significance.
(Image: Berlin Wall being torn down in 1989.)

5. Who is the leader shown in the picture, and what was his role in the end of bipolarity?
(Image: Mikhail Gorbachev)

Physical Education

PHYSICAL EDUCATION – STD. XII H.H.W

Theoretical Components:

Sports and Games :

Students might be asked to research and write about the history, rules, regulations, and famous players of a chosen sport. This could involve international and national history, and exploring specific skills and strategies.

Yoga and Fitness :

Assignments may include researching the benefits and contraindications of specific yoga asanas for various lifestyle diseases.

Sports Injuries:

Students may need to research and write about common injuries in chosen sports, including their causes, prevention, and first aid.

Sports Awards :

Research and writing about national and international sports awards like the Arjuna Award, Dronacharya Award, and Rajiv Gandhi Khel Ratna Award.

*

Practical Components* :

Practical File: Completing a practical file with fitness tests, asana demonstrations, and a game or sport of choice. This may involve administering fitness tests, demonstrating yoga poses, and exploring the rules, terminology, and skills of a specific sport.

Project Work: Students may be asked to choose a sports-related topic and prepare a project on it.

Assignments: Completing assignments related to the theoretical concepts covered in the curriculum.

Mathematics

1. If $\begin{vmatrix} 2X & 5 \\ 8 & X \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$,then the value of x-

(a) 3 (b) ±3 (c) ±6 (d) 6

2. If A is a square matrix such that $A^2 = A$, then $(I - A)^3 + A$ is equal to

(a) I (b) 0 (c) I – A (d) I + A

3. If A and B are two matrices of the order 3 × m and 3 × n, respectively, and m = n, then the order of matrix (5A – 2B) is

(a) m × 3 (b) 3 × 3 (c) m × n (d) 3 × n

4. The inverse of $\begin{vmatrix} -4 & 3 \\ 7 & -5 \end{vmatrix}$ is-

a) $\begin{bmatrix} -5 & -3 \\ 7 & -4 \end{bmatrix}$ b) $\begin{bmatrix} 5 & 3 \\ 7 & 4 \end{bmatrix}$

c) $\begin{bmatrix} -5 & 7 \\ 3 & -4 \end{bmatrix}$ d) $\begin{bmatrix} -5 & -3 \\ -7 & -4 \end{bmatrix}$

5 . If A is a square matrix of order 3 and |A| = 5, then the value of |2A′| is

(a) -10 (b) 10 (c) -40 (d) 40

6. The principal value of $\tan^{-1}(\tan 3\pi/5)$ is

(a) $2\pi/5$ (b) $-2\pi/5$ (c) $3\pi/5$ (d) $-3\pi/5$

7. If the order of the matrix is m×n, then how many elements will there be in the matrix?

(a) mn (b) $m^2 n^2$ (c) mn^2 (d) 2mn

8. What is the order of the matrix $A=\begin{bmatrix} 3 & 5 \\ 7 & 9 \end{bmatrix}$?

a) 2×3 (b) 2×2 (c) 3× 2 (d) 4×4

9. The domain of $\sin^{-1}(2x)$ is

(a) [0, 1] (b) [– 1, 1] (c) [-1/2, 1/2] (d) [–2, 2]

10. If A is a square matrix of order 3 and |A| = 5, then the value of |2A′| is

(a) -10 (b) 10 (c) -40 (d) 40

11. If $A = \begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$ then $(A - 2I)(A - 3I)$ is equal to-

a) A b) I c) 5I d) 0

The following questions 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 correct explanation for A.
b) Both A and R are true but R is not the correct explanation for A.
c) A is true but R is false.
d) A is false but R is true.

12. Assertion (A): $If\ |x\ 2\ 18\ x\ | = |6\ 2\ 18\ 6\ |$ then $x = \pm 6$
Reason (R): $If\ A$ is a skew-symmetric matrix of odd order, then $|A| = 0$.

13. Find the value of $(x - y)$ from the matrix equation.
$2[x\ 5\ 7\ y - 3\ ] + [-3\ -4\ 1\ 2\ ] = [7\ 6\ 15\ 14\ ]$

14. If A is a symmetric matrix and B is a skew symmetric matrix such that $A + B = [2\ 3\ 5\ -1\ ]$ then find $|AB|$.

15. By using the properties of determinants, show that det. $\left[1\ a\ a^2\ 1\ b\ b^2\ 1\ c\ c^2\ \right] = (a - b)(b - c)(c - a)$

15. **Prove that $\sin^{-1}(3/5) - \sin^{-1}(8/17) = \cos^{-1}(84/85)$.**

17. $If\ A$ **is a square matrix of order 3 such that** $A^2 = 2A$, **then find the value of** $|A|$.

18. Find the area of the triangle with vertices A (1, 1, 2), B(2, 3, 5) and C(1, 5, 5).

19. **Prove that :** $\left(\frac{cosx}{1+sinx}\right) = \frac{\pi}{4} - \frac{\pi}{2}, x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

20. Solve the following system of equations by matrix method.
$x + y + z = 9\ 2x - y + z = 5\ 4x + y - z = 7$

CHEMISTRY

SOLUTIONS

MCQ

1. Which of the following units is useful in relating concentration of solution with its vapour pressure?
   (i) mole fraction
   (ii) parts per million
   (iii) mass percentage
   (iv) molality

2. On dissolving sugar in water at room temperature solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid?
   (i) Sugar crystals in cold water.
   (ii) Sugar crystals in hot water.
   (iii) Powdered sugar in cold water.
   (iv) Powdered sugar in hot water.

3. At equilibrium the rate of dissolution of a solid solute in a volatile liquid solvent is _____.
   (i) less than the rate of crystallisation
   (ii) greater than the rate of crystallisation
   (iii) equal to the rate of crystallisation
   (iv) zero

4. 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 _____.
   (i) saturated
   (ii) supersaturated
   (iii) unsaturated
   (iv) concentrated

5. Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does **not** depend upon _____.
   (i) Temperature
   (ii) Nature of solute
   (iii) Pressure
   (iv) Nature of solvent

6. Low concentration of oxygen in the blood and tissues of people living at high altitude is due to _____.
   (i) low temperature
   (ii) low atmospheric pressure
   (iii) high atmospheric pressure
   (iv) both low temperature and high atmospheric pressure

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

8. Colligative properties depend on _____.
   (i) the nature of the solute particles dissolved in solution.
   (ii) the number of solute particles in solution.
   (iii) the physical properties of the solute particles dissolved in solution.
   (iv) the nature of solvent particles.

9. Which of the following aqueous solutions should have the highest boiling point?
   (i) 1.0 M NaOH
   (ii) 1.0 M Na_2SO_4
   (iii) 1.0 M NH_4NO_3
   (iv) 1.0 M KNO_3

10. The unit of ebulioscopic constant is _____.
   (i) K kg mol^{-1} or K $(molality)^{-1}$
   (ii) mol kg K^{-1} or K^{-1}(molality)

(iii) $kg\ mol^{-1}\ K^{-1}$ or $K^{-1}(molality)^{-1}$

(iv) $K\ mol\ kg^{-1}$ or K (molality)

11. In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M $MgCl_2$ solution is _____.

(i) the same

(ii) about twice

(iii) about three times

(iv) about six times

12. An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because _____.

(i) it gains water due to osmosis.

(ii) it loses water due to reverse osmosis.

(iii) it gains water due to reverse osmosis.

(iv) it loses water due to osmosis.

13. At a given temperature, osmotic pressure of a concentrated solution of a substance _____.

(i) is higher than that at a dilute solution.

(ii) is lower than that of a dilute solution.

(iii) is same as that of a dilute solution.

(iv) cannot be compared with osmotic pressure of dilute solution.

14. Which of the following statements is false?

(i) Two different solutions of sucrose of same molality prepared in different solvents will have the same depression in freezing point.

(ii) The osmotic pressure of a solution is given by the equation $\Pi = CRT$ (where C is the molarity of the solution).

(iii) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of barium chloride, potassium chloride, acetic acid and sucrose is $BaCl_2 > KCl > CH_3COOH >$ sucrose.

(iv) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution.

15. The values of Van't Hoff factors for KCl, NaCl and K_2SO_4, respectively, are _____.

(i) 2, 2 and 2

(ii) 2, 2 and 3

(iii) 1, 1 and 2

(iv) 1, 1 and 1

16. Which of the following statements is **false**?

(i) Units of atmospheric pressure and osmotic pressure are the same.

(ii) In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration.

(iii) The value of molal depression constant depends on nature of solvent.

(iv) Relative lowering of vapour pressure, is a dimensionless quantity.

17. Value of Henry's constant K_H _____.

(i) increases with increase in temperature.

(ii) decreases with increase in temperature.

(iii) remains constant.

(iv) first increases then decreases.

18. The value of Henry's constant K_H is _____.

(i) greater for gases with higher solubility.

(ii) greater for gases with lower solubility.

(iii) constant for all gases.

(iv) not related to the solubility of gases.

19. Consider the Fig. 2.1 and mark the correct option.

(i) water will move from side (A) to side (B) if a pressure lower than osmotic pressure is applied on piston (B).

(ii) water will move from side (B) to side (A) if a pressure greater than osmotic pressure is applied on piston (B).

(iii) water will move from side (B) to side (A) if a pressure equal to osmotic pressure is applied on piston (B).

(iv) water will move from side (A) to side (B) if pressure equal to osmotic pressure is applied on piston (A).

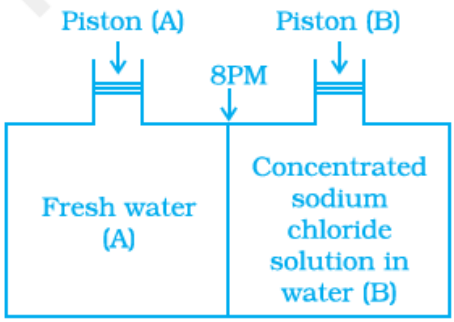


***Fig.** 2.1*

20. We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1M, 0.01M and 0.001M, respectively. The value of van't Hoff factor for these solutions will be in the order_____.

(i) $i_A < i_B < i_C$

(ii) $i_A > i_B > i_C$

(iii) $i_A = i_B = i_C$

(iv) $i_A < i_B > i_C$

21. On the basis of information given below mark the correct option.

Information:

(A) In bromoethane and chloroethane mixture intermolecular interactions of A–A and B–B type are nearly same as A–B type interactions.

(B) In ethanol and acetone mixture A–A or B–B type intermolecular interactions are stronger than A–B type interactions.

(C) In chloroform and acetone mixture A–A or B–B type intermolecular interactions are weaker than A–B type interactions.

(i) Solution (B) and (C) will follow Raoult's law.

(ii) Solution (A) will follow Raoult's law.

(iii) Solution (B) will show negative deviation from Raoult's law.

(iv) Solution (C) will show positive deviation from Raoult's law.

22. Two beakers of capacity 500 mL were taken. One of these beakers, labelled as "A", was filled with 400 mL water whereas the beaker labelled "B" was filled with 400 mL of 2 M solution of NaCl. At the same temperature both the beakers were placed in closed containers of same material and same capacity as shown in Fig. 2.2.

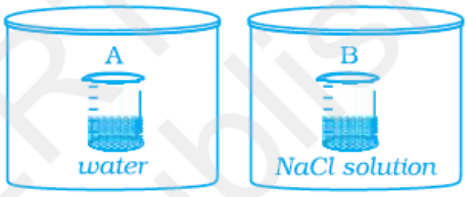


Fig. *2.2*

At a given temperature, which of the following statement is correct about the vapour pressure of pure water and that of NaCl solution.

(i) vapour pressure in container (A) is more than that in container (B).

(ii) vapour pressure in container (A) is less than that in container (B).

(iii) vapour pressure is equal in both the containers.

(iv) vapour pressure in container (B) is twice the vapour pressure in container (A).

23. If two liquids A and B form minimum boiling azeotrope at some specific composition then _____.

(i) A–B interactions are stronger than those between A–A or B–B.

(ii) vapour pressure of solution increases because more number of molecules of liquids A and B can escape from the solution.

(iii) vapour pressure of solution decreases because less number of molecules of only one of the liquids escape from the solution.

(iv) A–B interactions are weaker than those between A–A or B–B.

24. 4L of 0.02 M aqueous solution of NaCl was diluted by adding one litre of water. The molality of the resultant solution is _____.

(i) 0.004

(ii) 0.008

(iii) 0.012

(iv) 0.016

25. On the basis of information given below mark the correct option.

Information : On adding acetone to methanol some of the hydrogen bonds between methanol molecules break.

(i) At specific composition methanol-acetone mixture will form minimum boiling azeotrope and will show positive deviation from Raoult's law.

(ii) At specific composition methanol-acetone mixture forms maximum boiling azeotrope and will show positive deviation from Raoult's law.

(iii) At specific composition methanol-acetone mixture will form minimum boiling azeotrope and will show negative deviation from Raoult's law.

(iv) At specific composition methanol-acetone mixture will form maximum boiling azeotrope and will show negative deviation from Raoult's law.

26. K_H value 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.

(i) $HCHO < CH_4 < CO_2 < Ar$

(ii) $HCHO < CO_2 < CH_4 < Ar$

(iii) $Ar < CO_2 < CH_4 < HCHO$

(iv) $Ar < CH_4 < CO_2 < HCHO$

II. Multiple Choice Questions (Type-II)

Note : In the following questions two or more options may be correct.

27. Which of the following factor (s) affect the solubility of a gaseous solute in the fixed volume of liquid solvent?

(a) nature of solute (b) temperature (c) pressure

(i) (a) and (c) at constant T

(ii) (a) and (b) at constant P

(iii) (b) and (c) only

(iv) (c) only

28. Intermolecular forces between two benzene molecules are nearly of same strength as those between two toluene molecules. For a mixture of benzene and toluene, which of the following are **not** true?

(i) $\Delta_{mix} H$ = zero

(ii) $\Delta_{mix} V$ = zero

(iii) These will form minimum boiling azeotrope.

(iv) These will not form ideal solution.

29. Relative lowering of vapour pressure is a colligative property because _____.

(i) It depends on the concentration of a non electrolyte solute in solution and does not depend on the nature of the solute molecules.

(ii) It depends on number of particles of electrolyte solute in solution and does not depend on the nature of the solute particles.

(iii) It depends on the concentration of a non electrolyte solute in solution as well as on the nature of the solute molecules.

(iv) It depends on the concentration of an electrolyte or nonelectrolyte solute in solution as well as on the nature of solute molecules.

30. Van't Hoff factor i is given by the expression _____.

(i) $i = \dfrac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$

(ii) $i = \dfrac{\text{Abnormal molar mass}}{\text{Normal molar mass}}$

(iii) $i = \dfrac{\text{Observed colligative property}}{\text{Calculated colligative property}}$

(iv) $i = \dfrac{\text{Calculated colligative property}}{\text{Observed colligative property}}$

31. Isotonic solutions must have the same _____.

(i) solute

(ii) density

(iii) elevation in boiling point

(iv) depression in freezing point

32. Which of the following binary mixtures will have same composition in liquid and vapour phase?

(i) Benzene - Toluene

(ii) Water-Nitric acid

(iii) Water-Ethanol

(iv) *n*-Hexane - *n*-Heptane

33. In isotonic solutions _____.

(i) solute and solvent both are same.

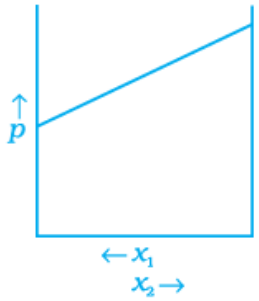
(ii) osmotic pressure is same.

(iii) solute and solvent may or may not be same.

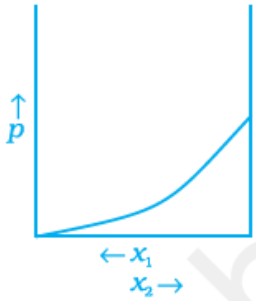
(iv) solute is always same solvent may be different.

34. For a binary ideal liquid solution, the variation in total vapour pressure versus composition of solution is given by which of the curves?

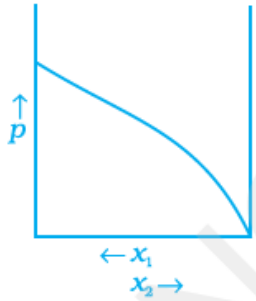
(i)



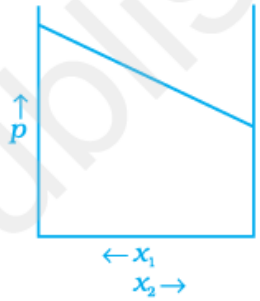
(ii)



(iii)



(iv)



35. Colligative properties are observed when _____.

(i) a non volatile solid is dissolved in a volatile liquid.

(ii) a non volatile liquid is dissolved in another volatile liquid.

(iii) a gas is dissolved in non volatile liquid.

(iv) a volatile liquid is dissolved in another volatile liquid.

Solutions

Assertion & Reason Type Questions

consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:
a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true but Reason (R) is false.
d. Assertion (A) is false but Reason (R) is true.

Q 1. Assertion (A): Molarity of a solution in liquid state changes with temperature.
Reason (R): The volume of a solution changes with change in temperature. (NCERT EXEMPLAR)

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 2. Assertion(A): Molarity of a solution changes with temperature.
Reason (R): Molarity is a colligative property. (CBSE SQP 2021 Term-1)

Answer : (c) Reason is false. Molarity is not a colligative property. It is a method of expressing concentration of solution.

Q 3. Assertion (A): In an ideal solution, Amix H is zero.
Reason (R): In an ideal solution, A-B interactions are lower than A-A and B-B interactions.

Answer : (c) In an ideal solution, A-B interactions are same as A-A and B-B interactions.

Q 4. Assertion (A): A solution of phenol and aniline will show negative deviations from Raoult's law.
Reason (R): In case of negative deviations from Raoult's law, A-B forces are stronger than A-A and B-B forces.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 5. Assertion (A): The solutions which show large positive deviations from Raoult's law form maximum boiling azeotropes.
Reason (R): 95% aqueous solution of ethanol is minimum boiling azeotrope.

Answer : (d) The solutions which show a large positive deviation from Raoult's law form minimum boiling azeotrope, and 95% ethanol solution is minimum boiling azeotrope.

Q 6. Assertion (A): When methyl alcohol is added to water, boiling point of water increases.
Reason (R): When a non-volatile solute is added to a volatile solvent, elevation in boiling point is observed.

Answer : (d) Assertion (A) is false but Reason (R) is true. Assertion is wrong because when methyl alcohol is added to water, boiling point of water decreases to hydrogen bonding.

Q 7. Assertion (A): Elevation in boiling point is a colligative property.
Reason (R): The lowering of vapour pressure of solution causes elevation in boiling point.

Answer : (c) The lowering of vapour pressure of solution causes depression in freezing point.

Q 8. Assertion (A): When NaCl is added to water, a depression in freezing point is observed.
Reason (R): The lowering of vapour pressure of a solution causes depression in the freezing point.

Answer : (a) When NaCl is added to water, a depression in freezing point is observed. This is due to lowering of vapour pressure of a solution. Lowering of vapour pressure is observed due to intermolecular interaction of solvent-solute particles.

Q 9. Assertion (A): Osmotic pressure is a colligative property.
Reason (R): Osmotic pressure is proportional to the molality.

Answer : (c) Osmotic pressure is proportional to the molarity, C of the solution at a given temperature T.

Q 10. Assertion (A): 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 (R): Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q11**. Assertion :** Molarity of a solution in liquid state changes with temperature.
Reason : The volume of a solution changes with change in temperature.

Q12**. 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., $p_s > p_o$.
Reason : In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

Q13**. Assertion :** If one component of a solution obeys Raoult's law over a certain range of composition, the other component will not obey Henry's law in that range.
Reason : Raoult's law is a special case of Henry's law.

Q14**. Assertion :** Azeotropic mixtures are formed only by non-ideal solutions and they may have boiling points either greater than both the components or less than both the components.

Reason : The composition of the vapour phase is same as that of the liquid phase of an azeotropic mixture.

Q15**. Assertion :** When methyl alcohol is added to water, boiling point of water increases.
Reason : When a volatile solute is added to a volatile solvent elevation in boiling point is observed.

Q16**. Assertion :** When NaCl is added to water a depression in freezing point is observed.
Reason : The lowering of vapour pressure of a solution causes depression in the freezing point.

Q17**. Assertion :** When a solution is separated from the pure solvent by a semi-permeable 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 solution to a region of low concentration solution.

ANSWER KEY 11 to 17

Q11 : (a)

Q12 : (c) Both the solute and solvent will form the vapours but vapour phase will become richer in the more volatile component.

Q13 : (b) **Q14 :** (b) **Q15 :** (d) **Q16 :** (a)

Q17 : (b)

Solutions

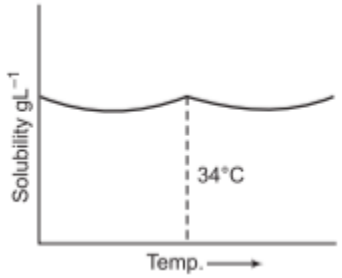
Case Study Based Questions

Case Study 1

Binary solutions can be of nine different types depending upon the nature of the solute and solvent whether solid, liquid or gas. They may be further classified as solid, liquid and gaseous solutions based on the component which acts as the solvent. However, the liquid solutions are the most important. Both solids and gases dissolve in liquids resulting in homogeneous mixtures, i.e. solutions. The solubility is governed by number of factors such as nature of solute and solvent, temperature, pressure etc. The concentrations of the solutions can be expressed in different ways such as normality, molarity, molality, mole fraction etc. Out of these, molality and mole fraction are better as they do not change with the change in temperature.

Read the given passage carefully and give the answer of the following questions:

Q1. Solubility curve of Na_2SO_4-$10H_20$ in water with temperature is given as:



a. solubility process is exothermic
b. solubility process is exothermic till 34°C and endothermic after 34°C
c. solubility process is endothermic till 34°C and exothermic after -34°C
d. solubility process is endothermic

Q2. $CuSO_4.5H_2O$ is a:

a. solution of solid in a liquid
b. solution of liquid in a solid
c. salt only and cannot be called a solution
d. co-ordination compound of copper with water molecules as the ligands

Q3. The molality of a sulphuric acid solution in which mole fraction of water is 0.85 is:

a. 9.80

c. 10.58

b. 10.50

d. 11.25

Q4. Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon:

a. temperature

c. pressure

b. nature of solute

d. nature of solvent

Answers

1. (c) solubility process is endothermic till 34°C and exothermic after -34°C

2. (b) solution of liquid in a solid

3. (a) 9.80

4. (c) pressure

Case Study 2

The four colligative properties of the dilute solutions help in calculating the molecular mass of the solute which is often called observed molecular mass. It may be same as the theoretical molecular mass (calculated from the molecular formula) if the solute behaves normally in solution. In case, it undergoes association or dissociation, the observed molar mass gives different results. The nature of the solute in solution is expressed in terms of van't Hoff factor (i) which may be 1 (if the solute behaves normally), less than 1 (if the solute associates) and more than 1 (if the solute dissociates). The extent of association or dissociation is represented by a which is:

$$\alpha = \frac{i-1}{(1/n-1)} \quad \text{(for association)} \qquad \text{or} \qquad \frac{i-1}{n-1} \quad \text{(for dissociation)}$$

Read the given passage carefully and give the answer of the following questions:

Q1. What is common in all the four colligative properties?

Q2. What is the expected value of van't Hoff factor for K4[Fe(CN)6] when it completely dissociates in water?

Q3. What is the value of van't Hoff factor for a dilute solution of K_2SO_4 in water?

OR

In the determination of molar mass of A*B- using colligative property, what will be the van't Hoff factor if the solute is 40% dissociated?

Answers

1. All of them depend upon the number of particles of the solute in the solution as well as its molar concentration.

2. $K4Fe(CN)_6]$ dissociates as: $4K^{++}$ $[Fe(CN)_6]^{3-}$

$$\alpha = \frac{i-1}{(n-1)} \quad \text{or} \quad 1 = \frac{i-1}{5-1} \quad \text{or} \quad i = 4+1 = 5$$

3. K_2SO4 dissociates completely in water as:

$$K_2SO_4 \xrightarrow{(aq)} 2K^+(aq) + SO_4^{2-}(aq)$$

$$\alpha = \frac{i-1}{(n-1)} \quad \text{or} \quad 1 = \frac{i-1}{3-1}$$

$$\text{or} \quad i = 2+1 = 3$$

OR

Dissociation of A+B- may be expressed as:

$$A^+B^- \overset{(aq)}{\rightleftharpoons} A^+(aq) + B^-(aq) \qquad (n=2)$$

$$\alpha = \frac{i-1}{(n-1)};\ 0.4 = \frac{i-1}{2-1}$$

$$\Rightarrow \qquad i = 1 + 0.4 = 1.4$$

Case Study 3

Henna is investigating the melting point of different salt solutions. She makes a salt solution using 10 mL of water with a known mass of NaCl salt. She puts the salt solution into a freezer and leaves it to freeze. She takes the frozen salt solution out of the freezer and measures the temperature when the frozen salt solution melts. She repeats each experiment.

S. No.	Mass of the salt used (in g)	Melting Point (in 0°C)	
		Reading Set 1	Reading Set 2
1.	0.3	–1.9	–1.9
2.	0.4	–2.5	–2.6
3.	0.5	–3.0	–5.5
4.	0.6	–3.8	–3.8
5.	0.8	–5.1	–5.0
6.	1.0	–6.4	–6.3

Assuming the melting point of pure water as 0°C, answer the following questions:

Q1. One temperature in the second set of results does not fit the pattern. Which temperature is that? Justify your answer.

Q2. Why did Henna collect two sets of results?

Q3. In place of NaCl, if Henna had used glucose, what would have been the melting point of the solution with 0.6 g glucose in it?

OR

What is the predicted melting point if 1.2 g of salt is added to 10 mL of water? Justify your answer. (CBSE SQP 2022-23)

Answers

1. The melting point of ice is the freezing point of water, We can use the depression in freezing point property in this case. 3rd reading for 0.5 g does not fit the pattern. There has to be an increase in depression of freezing point and therefore decrease in freezing point so also will there be a decrease in melting point when the amount of salt is increased but the trend is not followed in this case.

2. Henna collected two sets of results because this will help to avoid error in data collection and will give more objective data.

3. Given: Mass of glucose, W_2 = 0.6 g
Molar mass of glucose, M_2 = 180 g mol-1
Mass of water, W_1 = 10 g

$$\Delta T_f(\text{glucose}) = 1 \times K_f \times \frac{0.6 \times 1000}{180 \times 10} \quad ...(1)$$

Again, molar mass of NaCl, $M_2 = 58.5$ g

$$\Delta T_f(\text{NaCl}) = 3.8°C$$

$$\Delta T_f(\text{NaCl}) = 2 \times K_f \times \frac{0.6 \times 1000}{58.5 \times 10} \quad ...(2)$$

$$3.8 = 2 \times K_f \times \frac{0.6 \times 1000}{58.5 \times 10}$$

On dividing eq. (1) by eq. (2), we get

$$\frac{\Delta T_f(\text{glucose})}{3.8} = \frac{58.5}{2 \times 180}$$

or $$\Delta T_f(\text{glucose}) = 0.62$$

Freezing point or melting point = –0.62°C

OR

Depression in freezing point is directly proportional to molality (mass of solute when the amount of solvent remains same)

0.3 g salt will cause depression of 1.9°C.

0.6 g salt will cause depression of 3.8°C.

1.2 g salt will cause depression of 3.8 x 2 = 7.6°C

So, the predicted melting point is 7.6°C.

Solutions for Questions 4 to 13 are Given Below

Case Study 4

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

Case Study 5

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

(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.

Case Study 6

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.

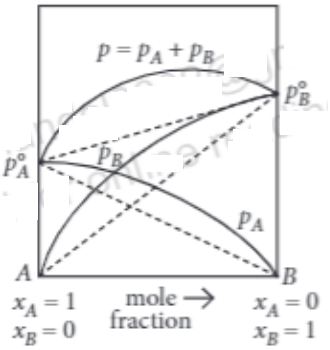
(b) $P_A < P_A^\circ x_A$ and $P_B < P_B^\circ x_B$

(c) Carbon tetrachloride and chloroform mixture is an example of positive deviations.

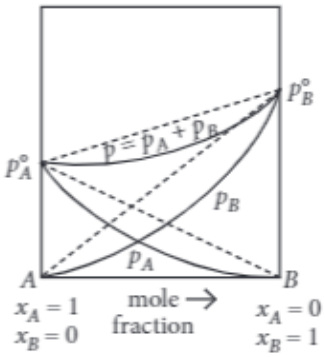
(d) All of these.

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

(a)



(b)



(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

Case Study 7

Read the passage given below and answer the following questions :

The properties of the solutions which depend only on the number of solute particles but not on the nature of the solute are called colligative properties. Relative lowering in vapour pressure is also an example of colligative properties.

For an experiment, sugar solution is prepared for which lowering in vapour pressure was found to be 0.061 mm of Hg. (Vapour pressure of water at 20°C is 17.5 mm of Hg.)

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

(i) Relative lowering of vapour pressure for the given solution is

(a) 0.00348 (b) 0.061 (c) 0.122 (d) 1.75

(ii) The vapour pressure (mm of Hg) of solution will be

(a) 17.5 (b) 0.61 (c) 17.439 (d) 0.00348

(iii) Mole fraction of sugar in the solution is

(a) 0.00348 (b) 0.9965 (c) 0.061 (d) 1.75

OR

If weight of sugar taken is 5 g in 108 g of water then molar mass of sugar will be

(a) 358 (b) 120 (c) 240 (d) 400

(iv) The vapour pressure (mm of Hg) of water at 293 K when 25 g of glucose is dissolved in 450 g of water is

(a) 17.2 (b) 17.4 (c) 17.120 (d) 17.02

Case Study 8

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 m (d) 1.29 m

(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 (b) 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)

Case Study 9

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.

Case Study 10

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, $\Delta T_f = \dfrac{K_f \times W_B \times 1000}{W_A \times M_B}$

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.

(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.

Case Study 11

Read the passage given below and answer the following questions :

According to Raoult's law, the partial pressure of two components of the solution may be given as :

$p_A = p_A^\circ x_A$ and $p_B = p_B^\circ x_B$

For an ideal solution (obeys Raoult's law always)

$\Delta H_{mix} = 0, \Delta V_{mix} = 0$

All solutions do not obey Raoult's law over entire range of concentration. These are known as non-ideal solutions.

For non-ideal solutions, $p_A \neq p_A^\circ x_A$ or $p_B \neq p_B^\circ x_B$

Positive deviation $\Rightarrow p_A > p_A^\circ x_A$ and $p_B > p_A^\circ x_B$

Negative deviation $\Rightarrow p_A < p_A^\circ x_A$ and $p_B < p_B^\circ x_B$

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 :** An ideal solution obeys Raoult's law.
Reason : In an ideal solution, solute-solute as well as solvent-solvent interactions are similar to solute-solvent interactions.

(ii) **Assertion :** Acetone and aniline show negative deviations.
Reason : H–bonding between acetone and aniline is stronger than that between acetone-acetone and aniline-aniline.

(iii) **Assertion :** Azeotropic mixtures are formed only by non-ideal solutions and they may have boiling points either greater than both the components or lesser than both the components.
Reason : The composition of the vapour phase is same as that of the liquid phase of an azeotropic mixture.

OR

Assertion : The solutions which show negative deviations from Raoult's law are called maximum boiling azeotropes.
Reason : 68% nitric acid and 32% water by mass form maximum boiling azeotrope.

(iv) **Assertion :** ΔH_{mix} and ΔV_{mix} are positive for an ideal solution.
Reason : The interactions between the particles of the components of an ideal solution are almost identical as between particles in the liquids.

Case Study 12

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.

Case Study 13

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, $K_b = \dfrac{MRT_b^2}{\Delta_{vap}H \times 1000}$

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.

4. **(i) (b):** Molar mass of KI = 166 g/mol

$$n_{KI} = \frac{20}{166} = 0.12 \text{ mol}$$

$$\text{Molality} = \frac{n_{KI}}{w_{H_2O}} \times 1000 = \frac{0.12}{80} \times 1000 = 1.5 \text{ m}$$

$n_{KI} = 0.12$ and $n_{water} = \frac{80}{18} = 4.44$

$$x_{KI} = \frac{n_{KI}}{n_{KI} + n_{H_2O}} = \frac{0.12}{0.12 + 4.44} = 0.0263$$

OR

(d) : Density of solution = 1.202 g/mL

$$\text{Volume of solution} = \frac{100 \text{ g}}{1.202 \text{ g/mL}} = 83.2 \text{ mL}$$

$$\text{Molarity} = \frac{n_{KI}}{\text{Volume of solution in L}}$$

$$= \frac{0.120 \text{ mol}}{0.0832 \text{ L}} = 1.4423 \text{ mol L}^{-1}$$

(ii) (a) : $x_2 = \frac{n_2}{n_1 + n_2}$; $x_1 = \frac{n_1}{n_1 + n_2}$; $\frac{x_2}{x_1} = \frac{n_2}{n_1}$

$$\frac{x_2}{x_1} = \frac{m_2 / M_2}{m_1 / M_1} = \frac{m_2}{m_1} \times \frac{M_1}{M_2} \quad \text{...(i)}$$

$$\text{Molality} = \frac{n_2}{m_1} = \frac{m_2}{M_2 \times m_1} \quad \text{...(ii)}$$

From (i) and (ii), $m = \frac{x_2}{x_1} \times \frac{1}{M_1}$; $x_1 = 1 - x_2$

Hence, $x_2 = \frac{mM_1}{1 + mM_1}$

(iii) (a): Mass does not depend on temperature while volume does. Hence, molarity depends on temperature.

(iv) (b): 1 M solution contains 1 mole of solute in less than 1000 g of the solvent whereas 1 m solution has 1 mole of the solute in 1000 g of the solvent.

5. **(i) (b) :** Moles of $C_6H_6 = \frac{7.8}{78} = 0.1$

Moles of $C_6H_5CH_3 = \frac{9.2}{92} = 0.1$

Mole fraction of $C_6H_6 = \frac{0.1}{0.1 + 0.1} = 0.5$

$\Rightarrow$ Mole fraction of $C_6H_5CH_3 = 0.5$

Vapour pressure of toluene = Vapour pressure of pure toluene × mole fraction of toluene

$= 0.0925 \times 0.5 = 0.04625$

Vapour pressure of benzene $= 0.256 \times 0.5 = 0.128$

Total vapour pressure of solution = 0.17425

(ii) (a): Moles of benzene in solution-II $= \frac{3.9}{78} = 0.05$

Moles of toluene in solution-II $= \frac{13.8}{92} = 0.15$

Vapour pressure of solution

$= 0.256 \times 0.05 + 0.0925 \times 0.15$

$= 0.0128 + 0.013875 = 0.026675$

(iii) (c) : Mole fraction of benzene in vapour phase

$$y_{benzene} = \frac{p_{benzene}}{P_{total}} = \frac{0.128}{0.17425} = 0.734$$

(iv) (a): Mole fraction of toluene in vapour phase in solution-I $= \frac{0.04625}{0.17425} = 0.2654$

Mole fraction of toluene in vapour phase in solution-II

$$= \frac{0.013875}{0.026675} = 0.520$$

Mole fraction of toluene in vapour phase in solution-II is greater than in solution-I.

Hence, statement II is correct.

Mole fraction of benzene in vapour phase in solution – I = 0.734

Mole fraction of benzene in vapour phase in solution-II $= \frac{0.0128}{0.026675} = 0.479$

Thus, mole fraction of benzene in vapour phase is less in solution-II.

OR

(a) : Benzene and toluene form an ideal solution.

6. **(i) (d) :** II represents negative deviations and III represents positive deviations.

OR

(a) : Acetone and aniline mixture represents negative deviations from Raoult's law hence for this mixture, ΔH_{mix} and ΔV_{mix} is negative.

(ii) (b): For positive deviations $p_A > p_A^\circ x_A$ and $p_B > p_B^\circ x_B$

(iii) (b): Water and nitric acid mixture shows negative deviations from Raoult's law, hence

$p_A < p_A^\circ x_A$ and $p_B < p_B^\circ x_B$

(iv) (d): Water–HCl mixture shows negative

deviations from Raoult's law and solutions showing negative deviations from ideal behaviour form maximum boiling azeotrope.

7. **(i)** **(a)** : Vapour pressure of water (p_A°) = 17.5 mm of Hg

Lowering of vapour pressure ($p_A^\circ - p_A$) = 0.061

Relative lowering of vapour pressure

$$= \frac{p_A^\circ - p_A}{p_A^\circ} = \frac{0.061}{17.5} = 0.00348$$

(ii) **(c)** : p = Vapour pressure of solvent – lowering in vapour pressure = 17.5 – 0.061 = 17.439 mm of Hg

(iii) **(a)** : $\frac{p_A^\circ - p_A}{p_A^\circ} = x_B = 0.00348$

Hence, mole fraction of sugar = 0.00348

OR

(c) : $$M_B = \frac{w_B M_A}{w_A\left(\frac{p_A^\circ - p_A}{p_A^\circ}\right)}$$

w_B = 5 g, M_A = 18 g, w_A = 108 g

$$M_B = \frac{5\times 18}{108\times 0.00348} = 240$$

(iv) **(b)**: $$\frac{p_A^\circ - p_A}{p_A^\circ} = x_B = \frac{w_B \times M_A}{M_B \times w_A}$$

$$\frac{17.5 - p_A}{17.5} = \frac{25\times 18}{450\times 180} = 5.56\times 10^{-3}$$

$17.5 - p_A = 17.5 \times 5.56 \times 10^{-3}$

$17.5 - p_A = 0.0973$

p = 17.40 mm Hg

8. **(i)** **(b)** : $$m = \frac{0.052}{180}\times\frac{1000}{80.2} = 0.0036$$

(ii) **(c)** : $\Delta T_b = K_b \times m = 5.2 \times 0.0036 = 0.0187$ K

$T_b = 373 + 0.0187 = 373.0187$ K ≈ 373.02 K

(iii) **(d)**: $\Delta T_f = K_f \times m = 1.86 \times 0.0036 = 0.067$ K

(iv) **(a)** : Moles of glucose $= \frac{0.052}{180} = 0.00028$

Moles of water $= \frac{80.2}{18} = 4.455$

Mole fraction of glucose $= \frac{0.00028}{4.45 + 0.00028} = 6.28 \times 10^{-5}$

OR

(c) : Depression in freezing point or elevation in boiling point is proportional to molarity which is proportional to number of moles.

For same amount, higher the molar mass of solute lower will be number of moles. Hence, lower will be the colligative property.

9. **(i)** **(b)**: $K_H = 4.27 \times 10^5$ mm Hg

p = 760 mm Hg

According to Henry's law, $p = K_H \times x_{CH_4}$

$$x_{CH_4} = \frac{p}{K_H} = \frac{760}{4.27\times 10^5} = 1.78\times 10^{-3}$$

(ii) **(a)** : According to Henry's law, $m = K_H \times p$

$6.56 \times 10^{-2} = K_H \times 1$

$K_H = 6.56 \times 10^{-2}$

For another case, $5 \times 10^{-2} = 6.56 \times 10^{-2} \times p$

$$p = \frac{5\times 10^{-2}}{6.56\times 10^{-2}} = 0.762 \text{ bar}$$

(iii) **(c)** : Higher the value of K_H at a given pressure, the lower is the solubility of the gas.

(iv) **(c)** : The mole fraction of the gas in solution

$$x = \frac{p}{K_H} = \frac{1}{150\times 10^3}$$

If n is the number of moles of gas in a solution of 1 L of water containing 55.5 mol then

$$x = \frac{n}{n + 55.5} \text{ or, } \frac{n}{55.5} = \frac{1}{150\times 10^3}$$

[$n + 55.5 \approx 55.5$, as n is very small]

$$n = \frac{55.5}{150}\times 10^{-3} = 0.37 \text{ millimoles}$$

OR

(a)

10. **(i)** **(b)**: Depression in freezing point is a colligative property which depends on the number of particles present in the solution. As both 0.1 M solution of glucose and 0.1 M solution of urea contain same number of moles (number of particles) therefore, both will have same depression in freezing point.

OR

(c) : Density of water is maximum at 4°C *i.e.*, 277 K.

(ii) **(a)**

(iii) **(a)** : Freezing point of a substance is defined as the temperature at which the vapour pressure of its liquid is equal to the vapour pressure of the corresponding solid. Since the addition of a non-volatile solute always lowers the vapour pressure of solvent, therefore it will be in equilibrium with solid phase at a lower pressure and hence at a lower temperature.

(iv) (d): Elevation in boiling point $(\Delta T_b) = K_b \times m$
Depression in freezing point $(\Delta T_f) = K_f \times m$
Elevation in boiling point and depression in freezing point are colligative properties *i.e.*, they depend only on the number of particles of the solute. Value of K_b and K_f are different, so ΔT_b and ΔT_f are also different.

11. (i) (a)

(ii) (a)

(iii) (b): Non-ideal solutions with positive deviation *i.e.*, having more vapour pressure than expected, boil at lower temperature while those with negative deviation boil at higher temperature than those of the components.

OR

(b)

(iv) (d) : For ideal solution, $\Delta H_{mix} = 0, \Delta V_{mix} = 0$

12. (i) (c) : If the red blood cells are placed in pure water, pressure inside the cells increases as the water is drawn in and the cell swells.

OR

(a) : (i) Osmotic pressure of urea
$w_B = 3.4$ g, $V = 200$ mL $= 0.2$ L, $T = 293$ K
$M_B = 60$, $R = 0.083$ L bar mol^{-1} K^{-1}

$$\pi = \frac{w_B RT}{M_B V} = \frac{3.4 \times 0.083 \times 293}{60 \times 0.2} = 6.89 \text{ bar}$$

(ii) Osmotic pressure of cane sugar

$$\pi = \frac{W_B RT}{M_B V} = \frac{1.6 \times 0.083 \times 293}{342 \times 0.2} = 0.57 \text{ bar}$$

$\pi = 6.89 + 0.57 = 7.46$ bar

(ii) (b)

(iii) (c) : Osmotic pressure is a colligative property.

(iv) (a)

13. (i) (c) : In pressure cooker, water boils above 100°C. When the lid of cooker is opened, pressure is lowered so that boiling point decreases and water boils again.

(ii) (a): $M_B = \frac{K_b \times 1000 \times W_B}{\Delta T_b \times W_A}$

$K_b = 2.53$ K kg mol^{-1}, $W_B = 3.24$ g,
$\Delta T_b = 0.81$ K, $W_A = 40$ g

$$M_B = \frac{2.53 \times 1000 \times 3.24}{0.81 \times 40} = 253$$

Let molecular formula of sulphur $= S_x$
$x \times 32 = 253$ or $x = 7.91 \approx 8$

(iii) (a)

(iv) (a)

OR

(c) : Elevation in boiling point of two isotonic solutions is the same and elevation in boiling point depends upon the concentration of solute not on the boiling point.

SOLUTIONS

1. Define the following modes of expressing the concentration of a solution. Which of these modes are independent of temperature and why?

(i) w/w (mass percentage) (v) *x* (mole fraction)
(ii) *V*/*V* (volume percentage) (vi) M (Molarity)

2. aoult's law explain how the total vapour pressure over the solution is related to mole fraction of components in the following solutions.
(i) CHCl3 (*l*) and CH2Cl2(*l*) (ii) NaCl(s) and H2O (*l*)

3. Explain the terms ideal and non-ideal solutions in the light of forces of interactions operating between molecules in liquid solutions.

4. Why is it not possible to obtain pure ethanol by fractional distillation? What general name is given to binary mixtures which show deviation from Raoult's law and whose components cannot be separated by fractional distillation. How many types of such mixtures are there?

5. When kept in water, raisin swells in size. Name and explain the phenomenon involved with the help of a diagram. Give three applications of the phenomenon.

6. Discuss biological and industrial importance of osmosis.

7. How can you remove the hard calcium carbonate layer of the egg without damaging its semiprermiable membrane? Can this egg be inserted into a bottle with a narrow neck without distorting its shape? Explain the process involved.

8. Why is the mass determined by measuring a colligative property in case of some solutes abnormal ? Discuss it with the help of Van't Hoff factor.

9. Under what condition molality and molarity of a solution are identical. Explain with suitable reason.
10. Addition of HgI_2 to KI (aq.) shows decrease in vapour pressure. Why?
11. Account for the following :–
    (a) $CaCl_2$ is used to clear snow from roads in hill stations.
    (b) Ethylene glycol is used as antifreeze solution in radiators of vehicles in cold countries.
    (c) The freezing point depression of 0.01 m NaCl is nearly twice that of 0.01 m glucose solution.
12. Give reasons for the following :–
    (a) RBC swell up and finally burst when placed in 0.1% NaCl solution.
    (b) When fruits and vegetables that have been dried are placed in water, they slowly swell and return to original form.
    (c) A person suffering from high blood pressure is advised to take less amount of table salt.
13. Glycerine, ethylene glycol and methanol are sold at the same price per kg. Which would be cheaper for preparing an antifreeze solution for the radiator of an automobile?
14. Determine the correct order of the property mentioned against them :
    (a) 10% glucose (p_1), 10% urea (p_2), 10% sucrose (p_3) **[Osmotic pressure]**

(b) 0.1 m NaCl, 0.1 m urea, 0.1 m $MgCl_2$ [**Elevation in b.pt.**]

(c) 0.1 m $CaCl_2$, 0.1 m sucrose, 0.1 m NaCl [**Depression in f.pt.**]

15. Two liquids X and Y on mixing form an ideal solution. The vapour pressure of the solution containing 2 mol of X and 1 mol of Y is 550 mm Hg. But when 4 mol of X and 1 mole of Y are mixed, the vapour pressure of solution thus formed is 560 mm Hg. What will be the vapour pressure of pure X and pure Y at this temperature? [**Ans. :** X = 600 mm Hg; Y = 400 mm Hg]
16. 2g of C_6H_5COOH dissolved in 25g of benzene shows depression in freezing point equal to 1.62K. Molar freezing point depression constant for benzene is 4.9 K kg mol^{-1}. What is the percentage association of acid if it forms a dimer in solution? [**Ans. :** 99.2%]
17. Calculate the amount of NaCl which must added to one kg of water so that the freezing point is depressed by 3K. Given K_f = 1.86 K kg mol^{-1}, Atomic mass : Na = 23, Cl = 35.5).

[**Ans. :** 0.81 mol NaCl]