Home Assignment 2023-24

Name: _____

Grade : XII (Science)   Roll. No. _____

Note:

1. Assignment Marks will be added in the Terminal Assessment.

2. Parents are required to let their child do his/her assignments on his/her own.

3. Use loose sheets if required to perform the task.

4. Best Assignment of the year will be recognised.

ENGLISH

Make a Project on any one of the topics.

1Artificial Intelligence and their benefits

2. Enlist various Apps like Chatgpt that are helpful to students and teachers.Discuss about any two in detail.

3.Various Career Prospects in 21century.

4. Do a Survey on the trend of settling abroad after studies. Prepare a report on it.

5. Enlist various methods/innovations that are helpful in controlling land pollution.Discuss about any two in detail.

6. Enlist various technological skills one must have in present time.Discuss about any two in detail.

7.Listen to any podcast on stigmas in our society/use of latest technology in agriculture/ emergence of women in powerful roles/ motivation/ issues of Teenage/ role of great leaders and write a report on it

8.Write any play with script and dialogues on any one topic women power/ Role of youth in empowering India/ Changes in Education system/ Social issues and awareness and make a project(group activity)

9. Make a video recording or audio recording on any burning issue/s in the society and prepare a project on the same.

Instructions

1.Title page bearing personal information like name, class sec, roll no, topic

2.Certificate of originality

3.Acknowlegement

4.Content to be written in about 800 to 1000 words.

5.Bibliography.

PUNJABI

ਸੁਝਾਏ ਗਏ ਪ੍ਰੋਜੈਕਟ (SUGGESTED PROJECTS)

1. ਖ਼ੁਰਾਕ (ਕਿਸੇ ਇੱਕ ਰਾਜ/ਪ੍ਰਦੇਸ਼ ਆਧਾਰਿਤ)

2. ਪੰਜਾਬ ਦੇ ਮੇਲੇ ਤੇ ਤਿਓਹਾਰ

3. ਬਜ਼ੁਰਗਾਂ ਦਾ ਘੱਟ ਰਿਹਾ ਸਤਿਕਾਰ (ਕਾਰਨ ਤੇ ਸੁਝਾਅ)

4. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਪੇਂਡੂ ਤੇ ਸ਼ਹਿਰੀ ਜੀਵਨ ਦਾ ਅੰਤਰ

5. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਆਨ-ਲਾਈਨ ਪੜ੍ਹਾਈ

6. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਉਭਰੀ ਲੋਕ-ਸੇਵਾ ਭਾਵਨਾ

7. ਕਰੋਨਾ-ਕਾਲ ਸਮੇਂ ਪ੍ਰਦੂਸ਼ਣ ਦੀ ਸਥਿਤੀ

8. ਕਰੋਨਾ-ਕਾਲ ਤੋਂ ਬਾਅਦ ਸਕੂਲਾਂ ਦੀ ਸਥਿਤੀ ਤੇ ਵਿਦਿਆਰਥੀਆਂ ਦਾ ਵਿਵਹਾਰ

9. ਵਿਦੇਸ਼ਾਂ ਵਿੱਚ ਜਾਣ ਦੀ ਹੋੜ (ਸ਼ੌਕ, ਮਜ਼ਬੂਰੀ ਜਾਂ ਸਮਾਜਿਕ ਰੁਤਬਾ)

10. ਸੋਸ਼ਲ ਮੀਡੀਆ ਦਾ ਵੱਧ ਰਿਹਾ ਪ੍ਰਭਾਵ

11. ਵਿਗਿਆਨੀ (ਸਮਾਜ ਨੂੰ ਦੇਣ)

12. ਲੇਖਕ (ਸਾਹਿਤਕ ਦੇਣ)

13. ਮਹਾਂਪੁਰਸ਼ (ਜੀਵਨੀ ਤੇ ਉਪਦੇਸ਼)

PHYSIAL EDUCATION

Kindly write about curative asanas for below mentioned life style diseases.

Hypertension

Obesity

Diabetes

Ashthama

Note - write 2 curative asanas for curing each disease.

PHYSICS

CLASS – XII

PHYSICS HOME – ASSIGNMENT

ASSERTION-REASON

.**Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.**

(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(c) If the Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

Q.1. **Assertion** : If the distance between parallel plates of a capacitor is halved and dielectric constant is three times, then the capacitance becomes 6 times.

   Reason : Capacity of the capacitor does not depend upon the nature of the material.

Q.2. **Assertion** : A parallel plate capacitor is connected across battery through a key. A dielectric slab of dielectric constant K is introduced between the plates. The energy which is stored becomes K times.

   Reason : The surface density of charge on the plate remains constant or unchanged.

Q.3. **Assertion** : The total charge stored in a capacitor is zero.

    Reason : The field just outside the capacitor is $\sigma/\varepsilon 0$. (σ is the charge density).

Q.4. **Assertion** : The electrostatic force between the plates of a charged isolated capacitor decreases when dielectric fills whole space between plates.

   Reason : The electric field between the plates of a charged isolated capacitance increases when dielectric fills whole space between plates.

Q.5. **Assertion** : Two concentric charged shells are given. The potential difference between the shells depends on charge of inner shell.

   Reason : Potential due to charge of outer shell remains same at every point inside the sphere.

MULTIPLE CHOICE QUESTIONS

6. An electric dipole of moment $\vec{p}$ is placed in a uniform electric field $\vec{E}$. Then

(i) the torque on the dipole is $\vec{p} \times \vec{E}$

(ii) the potential energy of the system is $\vec{p} \cdot \vec{E}$

(iii) the resultant force on the dipole is zero. Choose the correct option.

(a) (i), (ii) and (iii) are correct

(b) (i) and (iii) are correct and (ii) is wrong

(c) only (i) is correct

(d) (i) and (ii) are correct and (iii) is wrong

7. If a conductor has a potential $V \neq 0$ and there are no charges anywhere else outside, then

(a) there must be charges on the surface or in¬side itself.

(b) there cannot be any charge in the body of the conductor.

(c) there must be charges only on the surface.

(d) both (a) and (b) are correct.

8. **Which of the following statements is false for a perfect conductor?**

(a) The surface of the conductor is an equipoten-tial surface.

(b) The electric field just outside the surface of a conductor is perpendicular to the surface.

(c) The charge carried by a conductor is always uniformly distributed over the surface of the conductor.

(d) None of these.

9. **Dielectric constant for a metal is**

(a) zero

(b) infinite

(c) 1

(d) 10

10. **A**(a) increases K times

(b) remains unchanged

(c) decreases K times

(d) increases K-1 times

CASE BASED STUDY

Read the following source and answer any four out of the following questions:

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

11.Charge on a body that carries 200 excess electrons is:

a)-3.2 ×× 10-18 C

b)3.2 ×× 10 18 C

c)-3.2 ×× 10-17 C

d)3.2 ×× 10 -17 C

12.Charge on a body that carries 10 excess electrons is:

a)-1.6 ×× 10-18 C

b)1.6 ×× 10 -18 C

c)2.6 ×× 10-18 C

d)1.6 ×× 10-21 C

13.Mass of electron is:

9.1 ×× 10-31 kg

9.1 ×× 10-31 g

1.6 ×× 10-19 kg

1.6 ×× 10-19 g

SHORT ANSWERS QUESTIONS

1.Two charges each of + Q units are placed along a line. A third charge – q is placed between them. At what po-sition and for what value of q, will the system be in equilibrium?

2.What kind of charges are produced on each, when (i) a glass rod is rubbed with silk and

(ii) an ebonite rod is rubbed with wool?

3.Can a body have charge of 0.81019 C? Comment to justify your answer?

4.Name the experiment, which established quantum nature of electric charge.

5.How the mass of a body is affected on charging?

6.Force between two-point electric charges kept at a distance d apart in air is F. If these charges are kept at the same distance in water, how does the force between them change?

7.If the distance between two equal point charges is doubled and their individual charges are also doubled, what would happen to the force between them?

8.Ordinary rubber is an insulator. But the special rubber tires of aircrafts are made slightly conducting. Why is this necessary?

Electrostatics - II

1.The force acting between two-point charges q1 and q2 kept at some distance apart in air attractive or repulsive when (i) q1 q2 > 0 (ii) q1 q2 < 0.

2.Sketch the electric lines of force for two- point charges q1 and q2 (q1 > q2) separated by a distance d.

3.Express dielectric constant in terms of capacitance.

4.What is the effect of introducing a dielectric slab between the plates of a parallel plate capacitor?

5.An electric dipole of dipole moment 20 10-6 C is enclosed by closed surface. What is the net electric flux coming out of this surface?

6.Sketch graph to show how charge Q given to a capacitor of capacitance C varies with the potential difference.

7.A charged air capacitor has stored energy U0. What will be the energy stored when air is replaced by a dielectric of dielectric constant K, charge Q remaining the same.

8.In a parallel plate capacitor, the capacitance increases from 4F to 80 F on introducing the dielectric medium between the plates. What is the dielectric constant of the medium?

9.In an electric field an electron is kept freely. If a proton replaces this electron, what will be the relationship between the forces experienced by them?

10.What orientation of an electric dipole in a uniform electric field corresponds to its stable equilibrium?

11.The force between two point charges kept at a distance r apart in air is F. If the same charges are kept in water at same distance, how does the force between them change?

12.Two point electric charges of unknown magnitude and sign are placed at a distance 'd' apart. The electric intensity is zero at a point, not between the charges but on the line joining them. Write two essential conditions for this to happen.

Electrostatics and Capacitance

1.Electric charges q, q and -2q are placed at the corners of an equilateral triangle of side L. what is the magnitude of dipole moment of the system?

2.State Gauss's law in electrostatics. Show, with the help of a suitable example along with the figure, that the outward flux due to a point charge 'q', in vacuum within a closed surface, is independent of its size or shape and is given by q/εo.

3.Two parallel uniformly charged infinite plane sheets, '1' and '2', have charge densities + σ and – 2σ respectively. Give the magnitude and direction of the net electric field at a point (i) in between the two sheets and (ii) outside near the sheet '1'.

4.Three point charges q1, q2 and q3 are kept respectively at points A, B and C as shown in the figure.

Derive the expression for the electrostatic potential energy of the system.

5.Depict the equipotential surfaces due to (i) an electric dipole, (ii) two identical positive charges separated by a distance.

6.Find the ratio of the potential differences that must be applied across the parallel and the series combination of two identical capacitors so that the energy stored, in the two cases, becomes the same.

7.Find the electric field intensity due to a uniformly charged spherical shell at a point (i) outside the shell (ii) inside the shell. Plot the graph of electric field with distance from the center of the shell.

8.An electric dipole is held in a uniform electric field. (i) Using suitable diagram show that it does not undergo any translatory motion (ii) Derive an expression for torque acting on it and specify its direction.

9.A system has two charges q_A= 2.5 x10-7C and q_B= - 2.5 x10-7C located at points A

=(0,0, -15cm) and B = (0,0, +15cm) respectively. Calculate the total charge and dipole moment of the system.

10..Two capacitors of unknown capacitances C1 and C2 are connected first in series and then in parallel across a battery of 100 V. If the energy stored in the two combinations is 0.045 J and

0.25 J respectively, determine the value of C1 and C2. Also calculate the charge on each capacitor in parallel combination.

Note-

1 complete your practical file

2. Make a model on any topic from syllabus of physics which you can explain . Model must be working.

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CHEMISTRY

I. Choose the correct options from the following
1. Mole fraction of glycerine $C_3H_5(OH)_3$ in solution containing 36 g of water and 46 g of glycerine is

(a) 0.46   (b) 0.40   (c) 0.20   (d) 0.36

2. Out of molality (m), molarity (M), formality (F) and mole fraction (x), those which are independent of temperature are

(a) M, m   (b) F, x   (c) m, x   (d) M, x

3. Which of the following condition is not satisfied by an ideal solution?

(a) ΔHmixing = 0   (b) ΔVmixing = 0

(c) Raoult's Law is obeyed   (d) Formation of an azeotropic mixture

4. The boiling point of an azeotropic mixture of water and ethanol is less than that of water and ethanol. The mixture shows

(a) no deviation from Raoult's Law.

(b) positive deviation from Raoult's Law.

(c) negative deviation from Raoult's Law.

(d) that the solution is unsaturated.

5. Which has the lowest boiling point at 1 atm pressure?

(a) 0.1 M KCl   (b) 0.1 M Urea   (c) 0.1 M $CaCl_2$ (d) 0.1 M $AlCl_3$

6. Osmotic pressure of a solution is 0.0821 atm at a temperature of 300 K. The concentration in moles/litre will be

(a) 0.33   (b) 0.666   (c) 0.3×10^{-2} (d) 3

7. People add sodium chloride to water while boiling eggs. This is to

(a) decrease the boiling point.   (b) increase the boiling point.

(c) prevent the breaking of eggs.   (d) make eggs tasty.

8. The van't Hoff factor (i) accounts for

(a) degree of solubilisation of solute.

(b) the extent of dissociation of solute.

(c) the extent of dissolution of solute.

(d) the degree of decomposition of solution.

9. Which relationship is not correct?

$$(a)\ \Delta T_b = \frac{K_b.1000.W_2}{M_2.W_1} \qquad (b)\ M_2 = \frac{K_f.1000.W_1}{W_2.\Delta T_b}$$

$$(c)\ \pi = \frac{n_2}{V} \qquad (d)\ \frac{p^0 - p_s}{p^0} = \frac{W_2}{M_2} \times \frac{M_1}{W_1}$$

10. The molal elevation constant depends upon

(a) nature of solute.   (b) nature of the solvent.

(c) vapour pressure of the solution.   (d) enthalpy change

11. Concentration C gram equiv./Litre has a specific resistance R of a solution. The equivalent conductivity of the solution is

(a) 1000/ RC   (b) C /R   (c) R /C   (d) 1000R /C

12. Cell constant of an electrolytic solution is 0.5 cm−1 and resistivity 54 ohm-cm. Find conductance of the electrolytic solution.

(a) 1/ 36   (b) 1/ 56   (c) 1/97   (d) 1/27

13. Electrolyte solution has x as specific resistance and y is the molarity of the solution, then Δm is given by ___.

(a) 1000x/ y   (b) 1000 y/ x   (c) 1000/ xy   (d) xy/ 1000

14. Ionic conductance at infinite dilution is given find increasing order?

(a) $F^- < Cl^- < Br^- < I^-$ (b) $I^- < Br^- < F^- < Cl^-$

(c) $F^- < Cl^- < I^- < Br^-$ (d) $F^- < I^- < Cl^- < Br^-$

15. Platinum electrodes of a conductivity cell has 1.2 cm^2 area separated by a distance of 0.8 cm. Cell constant is

(a) 0.76 cm^{-1} (b) 1.5 cm^{-1}

(c) 0.96 cm^{-1} (d) 0.66 cm^{-1}

II.Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

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Q.1. Assertion : Molarity of a solution in liquid state changes with temperature.

Reason : The volume of a solution changes with change in temperature

Q.2. 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., ps > po.

Reason : In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

Q.3. 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.

Q.4. 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

Q.5. 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.

Q.6. Assertion : The resistivity for a substance is its resistance when it is one meter long and its area of cross section is one square meter.

Reason : The SI units of resistivity is ohm metre (m).

Q.7. Assertion : On increasing dilution, the specific conductance keep on increasing

Reason : On increasing dilution, degree of ionisation of weak electrolyte increases and molality of ions also increases.

Q.8. Assertion : Galvanised iron does not rust.

Reason : Zinc has a more negative electrode potential than iron.

III. Case study based.

Case Study Question 1:

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 200C 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

(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) 17.12   (d) 17.02

Case study question 2

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

(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 x 10^{-5} (b) 1.23 x 10^{-4} (c) 0.00625   (d) 0.000284

1) A solution of glucose in water is labelled as 10% w/w, what would be the molality and mole fraction of each component in the solution? If the density of solution is 1.2 g mL^{-1}, then what shall be the molarity of the solution?

2) How many mL of 0.1 M HCl are required to react completely with 1 g mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar amounts of both?

3) A solution is obtained by mixing 300 g of 25% solution and 400 g of 40% solution by mass. Calculate the mass percentage of the resulting solution.

4) An antifreeze solution is prepared from 222.6 g of ethylene glycol ($C_2H_6O_2$) and 200 g of water. Calculate the molality of the solution. If the density of the solution is 1.072 g mL–1, then what shall be the molarity of the solution?

5) A sample of drinking water was found to be severely contaminated with chloroform ($CHCl_3$) supposed to be a carcinogen. The level of contamination was 15 ppm (by mass): (i) express this in percent by mass (ii) determine the molality of chloroform in the water sample.

6) What role does the molecular interaction play in a solution of alcohol and water?

7) Why do gases always tend to be less soluble in liquids as the temperature is raised?

8) State Henry's law and mention some important applications.

9) The partial pressure of ethane over a solution containing 6.56×10^{-3} g of ethane is 1 bar. If the solution contains 5.00×10^{-2} g of ethane, then what shall be the partial pressure of the gas?

10). Account for the following:

   a) Helium is mixed in the gas cylinders of Scuba divers.
   b) Which is a better term for expressing concentration Molarity or Molality and why?
   c) Aquatic species feel comfortable during winter.
   d) Vapour pressure of a liquid decreases when a non-volatile solute is added to it.
   e) Out of 1M Urea and 1M KCl, 1M Urea has higher freezing point .
   f) When 2g of benzoic acid is dissolved in 25g of benzene,the experimentally determined moar mass is always greater than the true value.
   g) Mixture of ethanol and acetone shows positive deviation from Raoult's Law.
   h) The preservation of fruits by adding concentrated sugar solution protects against bacterial infection.
   i) Salt is sprinkled for clearing snow covered roads.
   j) Vapour pressure of a liquid decreases when a non volatile solute is added to it.

CHAPTER-ELECTROCHEMISTRY

11) How would you determine the standard electrode potential of the system Mg2+|Mg?

12) Can you store copper sulphate solutions in a zinc pot?

13) Consult the table of standard electrode potentials and suggest three substances that can oxidise ferrous ions under suitable conditions.

14) Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging.

15) Suggest two materials other than hydrogen that can be used as fuels in fuel cells.

16) Explain how rusting of iron is envisaged as setting up of an electrochemical cell.

In the button cells widely used in watches and other devices the following reaction takes place: $Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$ Determine Δ_rG^o and E^o for the reaction.

17) Three electrolytic cells A,B,C containing solutions of ZnSO4 , AgNO3 and CuSO4 , respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited?

18) Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

19) Calculate the emf of the cell in which the following reaction takes place:

$Ni(s) + 2Ag^+ (0.002\ M) \rightarrow Ni^{2+} (0.160\ M) + 2Ag(s)$ Given that E(cell) V = 1.05 V

20) The electrical resistance of a column of 0.05 mol L^{-1} NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.

A. Make an investigatory project on any one of the following topics:

1) On green chemistry- Biodiesel and bio-petrol
2) On sterilisation of water using bleaching powder
3) On analysis of fertilisers
4) On measuring the amount of Acetic acid in vinegar
5) On determination of contents of cold drinks
6) To study the quantity of casein in milk
7) On presence of insecticides and pesticides in fruits and vegetables
8) On preparation of soyabean milk
9) On study of rate of fermentation of juices
10) Determination of caffeine in tea samples
11) Determination of content of toothpaste
12) Dyeing of wool, silk and cotton in malachite green
13) Effect of Potassium Bisulphite as a food preservative
14) Study the rates of fermentation of fruit or vegetable juices
15) To Study and Analyse the Foaming Capacity of the Soap
16) To Determine Which Antacid Could Neutralize the most Stomach Acid
17) To Study the Various Effects of Dye on Different Types of Fabric
18) To Study the Power of Enzymes and Biotechnological Applications
19) Does Water Temperature Cause Metal to Expand and Contract?

Note:- For making project file following things should be mentioned.

1. Tile of project (including sub topic and submitted to)
2. Index
3. Acknowledgement
4. Aim
5. Apparatus or requirement
6. Brief content
7. Pics / Data / Flow Chart etc
8. Procedure
9. Observation
10. Inference or Result
11. Conclusion
12. Bibliography

BIOLOGY

MULTIPLE CHOICE QUESTIONS:-

1.Birth control tablets in females, popularly referred to as pills, prevent pregnancy by

A. delaying menstruation

B. inhibiting ovulation and implantation

C. suppressing sperm motility and fertility

D. blocking the entry of sperms during coitus

2.Which of the following statements is/are correct about ZIFT and GIFT as methods of helping conception in cases of infertility?

P) ZIFT can help where the female is unable to form a viable ovum.

Q) ZIFT uses methods of in vitro fertilisation.

R) GIFT involves the injection of one's own ovum into the body.

S) GIFT uses in vivo fertilisation method.

A. only P   B. only P and R

C. only Q, R and S   D. all - P, Q, R and S

3.A DNA sequence consisted of 20% adenine nucleotides.

What would be the percentage of cytosine nucleotides in the same DNA sequence?

A. 20%   B. 30%   C. 60%   D. 80%

4.In certain diseased conditions such as pneumonia, the fingernails of an individual

turn blue. What could be the reason for this?

A. blood does not reach fingernails due to an increase in fat content around the fingernails

B. nails become cold due to a decrease in fat content around the fingernails

C. reduced levels of oxygen in the blood

D. increase in oxygen levels in the blood

5. Which substance is secreted by corpus luteum ?

(A) Enzyme   (B) Bile   (C) Hormone   (D) Pheromone

6. Oestrous cycle is indication of:

(A) Menopause   (B) Pregnancy   (C) Estrogen secretion   (D) Breeding period

7. In human female ova are produced in :

(A) Ovarian follicles

(B) Uterus   (C) Vagina   (D) Oviduct

8. Sertoli cells help in of eggs

(A) Maturation of sperms   (B) Enzyme production

(C) Ovulation   D.) Maturation of eggs

9. Corpus luteum secretes.

(A) LH   (B) Progesterone   (C) Estrogen   (D) FSH

10. Acrosome is formed by:

(A) mitochondria   (B) cytoplasm   (b) Estrogen   (d) FSH

(C) nucleus

(D) golgi bodies

11. Development of gamete into embryo without ferilization.

(A) Pseudogamy   (B) Parthenogenesis   (C) Apogamy   (D) Parthenocarpy

12. Study of pollen grains is called

(A) Micrology   (B) Palynology   (C) Microsporogensis   (D) Aerology

13. When the body of ovule, embryo sac, micropyle and

funicle, all lie in one vertical plane, the ovule is.

(A) Orthotropous   (B) Campylotropous   (C) Anatropous (D) Amphitropous

14. Polar nuclei are suspended in.

(A) Egg   (B) Suspensor   (C) Central cell   (D) Nucellus

15. In flowering plants, a mature 'male gametophyte' derived

from a pollen mother cell by:

(A) Three 'mitotic division asibn

(B) One 'meiotic' two 'mitotic divisions'

(C) Two 'meiotic divisions'

(D) A single 'meiotic division'.

ASSERTION/REASON

ASSERTION/RE

A. Both assertion and reason are true, and reason is the correct explanation of assertion.

B.Both assertion and reason are true, but reason is not the correct explanation of assertion.

c.Assertion is true but reason is false.

D. Both assertion and reason are false.

1.Assertion: All flowering plants of this earth show sexual reproduction.

Reason: Some flowering plants perform vegetative mode

of reproduction also.

2. Assertion : Several hormonal and structural changes

are initiated in a plant before flowering.

Reason: Flower has male and female sex organs for sexual

reproduction.

3. Assertion: A typical anther of a flower is bilobed.

Reason: Each lobe of anther is dithecous.

4. Assertion: The penis is the male external genitali and made up of special erectile tissue.

Reason: The enlarged end of penis is glans penis is covered by a loose fold of skin i.e., fore skin

prepuce.

5. Assertion: The first menstruation cycle begins at

puberty and is called as menarche.

Reason: In human females, menstruation is repeated

at an average of interval of about 28 to 29 days.

6. Assertion: Corpus luteum is yellow endocrine gland in human female.

Reason: It secretes large amounts of progesterone and small amounts of estrogen.

7. Assertion: Zona pellucida is a cellular layer of ovum in human females.

Reason: Corona radiata is a non cellular layer of ovum.

8. 8. Assertion: Reproductive tract infection is due to virus, bacteria or protozoans.

Reason: These infections are usually not curable

9. Assertion: In IVF, fertilisation is performed inside the test tube.

Reason: Embryo with more than 8 blastomeres transferred into the uterus.

10. Assertion: In ZIFT technique, zygote is release into the uterus for implantation.

Reason: In GIFT technique, mixture of gametes is released into the fallopian tube.

SHORT ANSWER QUESTIONS

1. Correct the following statement: i. Surgical method of contraception prevents the gamete formation.

ii. All sexually transmitted diseases are completely curable

iii. Oral pills are a very popular contraceptive among rural women.

 iv. In E.T technique embryo or always transferred into the uterus.

2. Age group of 15 to 24 years is highly vulnerable to sexual transmitted diseases. What preventive measures should be taken.

3. 'Parturition is induced by a complex neuro endocrine mechanism'.Justify

4. Describe the process of fertilisation and implantation.

5. Study the graph of menstruation cycle and identify the

   A. 5th day to12th day of the cycle.
   B. 14 day of the cycle
   C. 16th day to 25th day of the cycle.

6. Why does Corpus luteum secrete large amounts of progesterone during the luteal phase of the menstruation cycle?

7. How many eggs are released by human ovary in a month? How many eggs do you think would have been released if the mother give birth to identical twins? Would you answer change if the twins born were fraternal?

8. In case of polyembryony if an embryo develops from the synergid and another from the nucellus which is haploid and which is diploid?

9. explain embryo formation in monocotyledons.

10. If you squeeze a seed of orange you might observe many embryos of different sizes? How is it possible to explain?

- **DRAW WELL LABELLED DIAGRAMS OF UNIT REPRODUCTION.**

PROJECT

1. To prepare project of 35-40 pages on the topic already discussed It should include:

• Cover page

• Index

• Acknowledgement

• Introduction

• Details about the project

• Bibliography

PRESENTATION

• Short presentation on Topic (unit REPRODUCTION)

• Instructions:

1. Topic must have an introduction.

2. Complete Information about REPRODUCTION and topic.

3. Relevant diagram must be attached with your presentation

4. Cover page must be attached

Mode: PPT/Video

PRACTICAL FILE

NOTE :-

Complete your notes.

Complete your practical

File.

Learn full syllabus

Inverse Trigonometric Functions

1. Find the value of $\tan^{-1}\left(\tan\dfrac{5\pi}{6}\right)+\cos^{-1}\left(\cos\dfrac{13\pi}{6}\right)$.

2. Evaluate $\cos\ \cos^{-1}\ \dfrac{-\sqrt{3}}{2}\ \ \dfrac{}{6}$.

3. Prove that $\cot\ \dfrac{}{4}-2\cot^{-1}3\ \ \ 7$.

4. Find the value of $\tan^{-1}\ \ -\dfrac{1}{\sqrt{3}}\ \ \cot^{-1}\ \dfrac{1}{\sqrt{3}}\ \ \tan^{-1}\ \sin\ \dfrac{-}{2}$

5. Find the value of $\tan^{-1}\left(\tan\dfrac{2\pi}{3}\right)$.

6. Show that $2\tan^{-1}(-3)=\dfrac{-}{2}+\tan^{-1}\left(\dfrac{-4}{3}\right)$.

7. Find the real solutions of the equation

$$\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\dfrac{\pi}{2}.$$

8. Find the value of the expression $\sin\left(2\tan^{-1}\dfrac{1}{3}\right)+\cos\left(\tan^{-1}2\sqrt{2}\right)$.

9. If $2 \tan^{-1} (\cos \theta) = \tan^{-1} (2 \operatorname{cosec} \theta)$, then show that $\theta = \dfrac{\pi}{4}$,

   where n is any integer.

10. Show that $\cos\left(2\tan^{-1}\dfrac{1}{7}\right) = \sin\left(4\tan^{-1}\dfrac{1}{3}\right)$.

11. Solve the following equation $\cos\left(\tan^{-1} x\right) = \sin\left(\cot^{-1}\dfrac{3}{4}\right)$.

12. Prove that $\tan^{-1}\dfrac{\sqrt{1\ x^2}\ \sqrt{1-x^2}}{\sqrt{1\ x^2} - \sqrt{1-x^2}}\quad\dfrac{}{4}\quad\dfrac{1}{2}\cos^{-1} x^2$

13. Find the simplified form of $\cos^{-1}\dfrac{3}{5}\cos x\quad\dfrac{4}{5}\sin x$, where $x \in\quad\dfrac{-3}{4}$

14. Prove that $\sin^{-1}\dfrac{8}{17}\quad \sin^{-1}\dfrac{3}{5}\quad \sin^{-1}\dfrac{77}{85}$.

15. Show that $\sin^{-1}\dfrac{5}{13}\quad \cos^{-1}\dfrac{3}{5}\quad \tan^{-1}\dfrac{63}{16}$.

16. Prove that $\tan^{-1}\dfrac{1}{4} + \tan^{-1}\dfrac{2}{9} = \sin^{-1}\dfrac{1}{\sqrt{5}}$.

17. Find the value of $4 \tan^{-1} \dfrac{1}{5} - \tan^{-1} \dfrac{1}{239}$.

18. Show that $\tan \dfrac{1}{2} \sin^{-1} \dfrac{3}{4} = \dfrac{4 - \sqrt{7}}{3}$ and justify why the other value $\dfrac{4 + \sqrt{7}}{3}$ is ignored?

19. If $a_1, a_2, a_3, \ldots, a_n$ is an arithmetic progression with common difference d, then evaluate the following expression.

$$\tan \left[\tan^{-1} \left(\dfrac{d}{1 + a_1 a_2} \right) + \tan^{-1} \left(\dfrac{d}{1 + a_2 a_3} \right) + \tan^{-1} \left(\dfrac{d}{1 + a_3 a_4} \right) + \ldots + \tan^{-1} \left(\dfrac{d}{1 + a_{n-1} a_n} \right) \right].$$

Multiple Choice Questions

Choose the correct answers from the given four options in each of the Exercises from 20 to 37 (M.C.Q.).

20. Which of the following is the principal value branch of $\cos^{-1} x$?

    (A) $\left[\dfrac{-\pi}{2}, \dfrac{\pi}{2} \right]$ (B) $(0, \pi)$

    (C) $[0, \pi]$ (D) $(0, \pi) - \left\{ \dfrac{\pi}{2} \right\}$

21. Which of the following is the principal value branch of $\operatorname{cosec}^{-1} x$?

(A)　·75　　　(B)　1·5　　(C)　·96　　(D)　sin 1·5

28. The value of $\cos^{-1} \cos \dfrac{3}{2}$ is equal to

(A) $\dfrac{\pi}{2}$　　　(B) $\dfrac{3\pi}{2}$　(C) $\dfrac{5\pi}{2}$　(D) $\dfrac{7\pi}{2}$

29. The value of the expression $2\sec^{-1} 2 + \sin^{-1} \dfrac{1}{2}$ is

(A) $\dfrac{\pi}{6}$　　　(B) $\dfrac{5\pi}{6}$　(C) $\dfrac{7\pi}{6}$　(D) 1

30. If $\tan^{-1} x + \tan^{-1} y = \dfrac{4\pi}{5}$, then $\cot^{-1} x + \cot^{-1} y$ equals

(A) $\dfrac{\pi}{5}$　　　(B) $\dfrac{2\pi}{5}$　(C) $\dfrac{3}{5}$　(D) π

31. If $\sin^{-1} \dfrac{2a}{1 \ a^2}$　$\cos^{-1} \dfrac{1-a^2}{1 \ a^2}$　$\tan^{-1} \dfrac{2x}{1-x^2}$, where $a, x \in \ ]0, 1$, then the value of x is

(A) 0　　　(B) $\dfrac{a}{2}$　(C) a　(D) $\dfrac{2a}{1-a^2}$

32. The value of $\cot \cos^{-1} \dfrac{7}{25}$ is

(A) $\dfrac{25}{24}$ (B) $\dfrac{25}{7}$ (C) $\dfrac{24}{25}$ (D) $\dfrac{7}{24}$

33. The value of the expression $\tan \dfrac{1}{2} \cos^{-1} \dfrac{2}{\sqrt{5}}$ is

(A) $2\sqrt{5}$ (B) $\sqrt{5}-2$

(C) $\dfrac{\sqrt{5}\ 2}{2}$ (D) $5\sqrt{2}$

$$\left[\text{Hint}: \tan\dfrac{\theta}{2} = \sqrt{\dfrac{1-\cos\theta}{1+\cos\theta}} \right]$$

34. If $|x| \le 1$, then $2\tan^{-1} x + \sin^{-1} \dfrac{2x}{1\ x^2}$ is equal to

(A) $4\tan^{-1} x$ (B) 0 (C) $\dfrac{}{2}$ (D) π

35. If $\cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$, then $\alpha(\beta+\gamma) + \beta(\gamma+\alpha) + \gamma(\alpha+\beta)$ equals

(A) 0 (B) 1 (C) 6 (D) 12

36. The number of real solutions of the equation $\sqrt{1+\cos 2x} = \sqrt{2}\cos^{-1}(\cos x)$ in $\left[\dfrac{\pi}{2}, \pi\right]$ is

(A) 0 (B) 1 (C) 2 (D) Infinite

37. If $\cos^{-1}x > \sin^{-1}x$, then

(A) $\dfrac{1}{\sqrt{2}} < x \le 1$ (B) $0 \le x < \dfrac{1}{\sqrt{2}}$

(C) $-1 \le x < \dfrac{1}{\sqrt{2}}$ (D) $x > 0$

1. If a matrix has 28 elements, what are the possible orders it can have? What if it has 13 elements?

2. In the matrix $A = \begin{matrix} a & 1 & x \\ 2 & \sqrt{3} & x^2 & y \\ 0 & 5 & \dfrac{2}{5} \end{matrix}$, write :

    (i)   The order of the matrix A

    (ii) The number of elements

    (iii) Write elements a_{23}, a_{31}, a_{12}

3. Construct $a_{2 \times 2}$ matrix where

    (i) $a_{ij} = \dfrac{(i\ 2j)^2}{2}$

    (ii) $a_{ij} = |\ 2i \quad 3j\,|$

4. Construct a 3×2 matrix whose elements are given by $a_{ij} = e^{ix}\sin jx$

5. Find values of a and b if $A = B$, where

    $A = \begin{matrix} a & 4 & 3b \\ 8 & 6 \end{matrix}$, $B = \begin{matrix} 2a & 2 & b^2 & 2 \\ 8 & b^2 & 5b \end{matrix}$

6. If possible, find the sum of the matrices A and B, where $A = \begin{matrix} \sqrt{3} & 1 \\ 2 & 3 \end{matrix}$,

and B = $\begin{matrix} x & y & z \\ a & b & 6 \end{matrix}$

7. If X = $\begin{matrix} 3 & 1 & 1 \\ 5 & 2 & 3 \end{matrix}$ and Y = $\begin{matrix} 2 & 1 & 1 \\ 7 & 2 & 4 \end{matrix}$, find

    (i)   X + Y   (ii)   2X − 3Y

    (iii)   A matrix Z such that X + Y + Z is a zero matrix.

8. Find non-zero values of x satisfying the matrix equation:

$$x\begin{bmatrix} 2x & 2 \\ 3 & x \end{bmatrix} + 2\begin{bmatrix} 8 & 5x \\ 4 & 4x \end{bmatrix} = 2\begin{bmatrix} (x^2+8) & 24 \\ (10) & 6x \end{bmatrix}.$$

9. If A = $\begin{matrix} 0 & 1 \\ 1 & 1 \end{matrix}$ and B = $\begin{matrix} 0 & 1 \\ 1 & 0 \end{matrix}$, show that $(A + B)(A - B) \neq A^2 - B^2$

10. Find the value of x if

$$\begin{bmatrix} 1 & x & 1 \end{bmatrix}\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$$

11. Show that A = $\begin{matrix} 5 & 3 \\ 1 & 2 \end{matrix}$ satisfies the equation $A^2 - 3A - 7I = O$ and hence find A^{-1}.

12. Find the matrix A satisfying the matrix equation:

$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} 3 & 2 \\ 5 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

13. Find A, if $\begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix} A = \begin{bmatrix} 4 & 8 & 4 \\ 1 & 2 & 1 \\ 3 & 6 & 3 \end{bmatrix}$

14. If A = $\begin{bmatrix} 3 & 4 \\ 1 & 1 \\ 2 & 0 \end{bmatrix}$ and B = $\begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$, then verify $(BA)^2 \neq B^2A^2$

15. If possible, find BA and AB, where

$$A = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ 2 & 3 \\ 1 & 2 \end{bmatrix}.$$

16. Show by an example that for $A \neq O, B \neq O, AB = O$.

17. Given A = $\begin{bmatrix} 2 & 4 & 0 \\ 3 & 9 & 6 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 4 \\ 2 & 8 \\ 1 & 3 \end{bmatrix}$. Is $(AB)' = B'A'$?

18. Solve for x and y:

$$x \begin{bmatrix} 2 \\ 1 \end{bmatrix} + y \begin{bmatrix} 3 \\ 5 \end{bmatrix} + \begin{bmatrix} -8 \\ -11 \end{bmatrix} = O.$$

19. If X and Y are 2 × 2 matrices, then solve the following matrix equations for X and Y

$$2X + 3Y = \begin{matrix} 2 & 3 \\ 4 & 0 \end{matrix}, 3X + 2Y = \begin{matrix} 2 & 2 \\ 1 & 5 \end{matrix}.$$

20. If A = 3 5, B = 7 3, then find a non-zero matrix C such that AC = BC.

21. Give an example of matrices A, B and C such that AB = AC, where A is non-zero matrix, but B ≠ C.

22. If A = $\begin{matrix} 1 & 2 \\ 2 & 1 \end{matrix}$, B = $\begin{matrix} 2 & 3 \\ 3 & 4 \end{matrix}$ and C = $\begin{matrix} 1 & 0 \\ 1 & 0 \end{matrix}$, verify :

     (i) (AB) C = A (BC)   (ii) A (B + C) = AB + AC.

23. If P = $\begin{matrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{matrix}$ and Q = $\begin{matrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{matrix}$, prove that

PQ = $\begin{matrix} xa & 0 & 0 \\ 0 & yb & 0 \\ 0 & 0 & zc \end{matrix}$ = QP.

24. If: $\begin{bmatrix} 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix} = A$, find A.

25. If $A = \begin{bmatrix} 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 3 & 4 \\ 8 & 7 & 6 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$, verify that $A(B+C) = (AB+AC)$.

26. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$, then verify that $A^2 + A = A(A+I)$, where I is 3×3 unit matrix.

27. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 4 & 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 \\ 1 & 3 \\ 2 & 6 \end{bmatrix}$, then verify that :

   (i) $(A')' = A$

   (ii) $(AB)' = B'A'$

   (iii) $(kA)' = (kA')$.

28. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \\ 5 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 6 & 4 \\ 7 & 3 \end{bmatrix}$, then verify that :

(i) $(2A + B)' = 2A' + B'$

(ii) $(A - B)' = A' - B'$.

29. Show that $A'A$ and AA' are both symmetric matrices for any matrix A.

30. Let A and B be square matrices of the order 3×3. Is $(AB)^2 = A^2 B^2$? Give reasons.

31. Show that if A and B are square matrices such that AB = BA, then
$$(A + B)^2 = A^2 + 2AB + B^2.$$

32. Let $A = \begin{matrix} 1 & 2 \\ 1 & 3 \end{matrix}$, $B = \begin{matrix} 4 & 0 \\ 1 & 5 \end{matrix}$, $C = \begin{matrix} 2 & 0 \\ 1 & 2 \end{matrix}$ and $a = 4, b = -2$.

Show that:

(a) $A + (B + C) = (A + B) + C$

(b) $A (BC) = (AB) C$

(c) $(a + b)B = aB + bB$

(d) $a (C–A) = aC - aA$

(e) $(A^T)^T = A$

(f) $(bA)^T = b A^T$

(g) $(AB)^T = B^T A^T$

(h) $(A –B)C = AC - BC$

(i) $(A - B)^T = A^T - B^T$

33. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then show that $A^2 = \begin{bmatrix} \cos2\theta & \sin2\theta \\ -\sin2\theta & \cos2\theta \end{bmatrix}$.

34. If $A = \begin{bmatrix} 0 & x \\ x & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $x^2 = -1$, then show that $(A+B)^2 = A^2 + B^2$.

35. Verify that $A^2 = I$ when $A = \begin{bmatrix} 0 & 1 & 1 \\ 4 & 3 & 4 \\ 3 & 3 & 4 \end{bmatrix}$.

36. Prove by Mathematical Induction that $(A')^n = (A^n)'$, where $n \in N$ for any square matrix A.

37. Find inverse, by elementary row operations (if possible), of the following matrices

(i) $\begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix}$

(ii) $\begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix}$

38. If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then find values of x, y, z and w.

39. If $A = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$, find a matrix C such that $3A + 5B + 2C$ is a null matrix.

40. If $A = \begin{bmatrix} 3 & 5 \\ 4 & 2 \end{bmatrix}$, then find $A^2 - 5A - 14I$. Hence, obtain A^3.

41. Find the values of a, b, c and d, if

$$3\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} a & 6 \\ 1 & 2d \end{bmatrix} + \begin{bmatrix} 4 & a+b \\ c+d & 3 \end{bmatrix}.$$

42. Find the matrix A such that

$$\begin{bmatrix} 2 & 1 \\ 1 & 0 \\ 3 & 4 \end{bmatrix} A = \begin{bmatrix} 1 & 8 & 10 \\ 1 & 2 & 5 \\ 9 & 22 & 15 \end{bmatrix}.$$

43. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \end{bmatrix}$, find $A^2 + 2A + 7I$.

44. If $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$, and $A^{-1} = A'$, find value of α.

45. If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & 1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix, find the values of a, b and c.

46. If $P(x) = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, then show that

$$P(x) \cdot P(y) = P(x + y) = P(y) \cdot P(x).$$

47. If A is square matrix such that $A^2 = A$, show that $(I + A)^3 = 7A + I$.

48. If A, B are square matrices of same order and B is a skew-symmetric matrix, show that A'BA is skew symmetric.

49. If $AB = BA$ for any two sqaure matrices, prove by mathematical induction that $(AB)^n = A^n B^n$.

50. Find x, y, z if $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfies $A' = A^{-1}$.

51. If possible, using elementary row transformations, find the inverse of the following matrices

(i) $\begin{bmatrix} 2 & 1 & 3 \\ 5 & 3 & 1 \\ 3 & 2 & 3 \end{bmatrix}$ (ii) $\begin{bmatrix} 2 & 3 & 3 \\ 1 & 2 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ (iii) $\begin{bmatrix} 2 & 0 & 1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

52. Express the matrix $\begin{bmatrix} 2 & 3 & 1 \\ 1 & 1 & 2 \\ 4 & 1 & 2 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

Multiple Choice Questions

Choose the correct answer from the given four options in each of the Exercises 53 to 67.

53. The matrix $P = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a

(A)   square matrix   (B)   diagonal matrix

(C)   unit matrix   (D)   none

54. Total number of possible matrices of order 3×3 with each entry 2 or 0 is

(A)   9   (B)   27   (C)   81   (D)   512

55. If $\begin{bmatrix} 2x & y & 4x \\ 5x & 7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y & 13 \\ y & x & 6 \end{bmatrix}$, then the value of $x + y$ is

(A) $x = 3, y = 1$ (B) $x = 2, y = 3$

(C) $x = 2, y = 4$ (D) $x = 3, y = 3$

56. If $A = \frac{1}{2}\begin{bmatrix} \sin^{-1}(x\pi) & \tan^{-1}\frac{x}{\pi} \\ \sin^{-1}\frac{x}{\pi} & \cot^{-1}(\pi x) \end{bmatrix}$, $B = \frac{1}{\pi}\begin{bmatrix} \cos^{-1}(x\pi) & \tan^{-1}\frac{x}{\pi} \\ \sin^{-1}\frac{x}{\pi} & \tan^{-1}(\pi x) \end{bmatrix}$, then

$A - B$ is equal to

(A)   I   (B)   O   (C)   2I   (D) $\frac{1}{2}I$

1. Let $A = \{a, b, c\}$ and the relation R be defined on A as follows:
$$R = \{(a, a), (b, c), (a, b)\}.$$
Then, write minimum number of ordered pairs to be added in R to make R reflexive and transitive.

2. Let D be the domain of the real valued function f defined by $f(x) = \sqrt{25-x^2}$.
Then, write D.

3. Let $f, g : R \rightarrow R$ be defined by $f(x) = 2x + 1$ and $g(x) = x^2 - 2$, $\forall x \in R$, respectively. Then, find $g \circ f$.

4. Let $f : R \rightarrow R$ be the function defined by $f(x) = 2x - 3$ $\forall x \in R$. write f^{-1}.

5. If $A = \{a, b, c, d\}$ and the function $f = \{(a, b), (b, d), (c, a), (d, c)\}$, write f^{-1}.

6. If $f : R \rightarrow R$ is defined by $f(x) = x^2 - 3x + 2$, write $f(f(x))$.

7. Is $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ a function? If g is described by $g(x) = \alpha x + \beta$, then what value should be assigned to α and β.

8. Are the following set of ordered pairs functions? If so, examine whether the mapping is injective or surjective.
   (i) $\{(x, y): x$ is a person, y is the mother of $x\}$.
   (ii) $\{(a, b): a$ is a person, b is an ancestor of $a\}$.

9. If the mappings f and g are given by
$f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(2, 3), (5, 1), (1, 3)\}$, write $f \circ g$.

10. Let C be the set of complex numbers. Prove that the mapping $f : C \rightarrow R$ given by $f(z) = |z|$, $\forall z \in C$, is neither one-one nor onto.

11. Let the function $f : R \rightarrow R$ be defined by $f(x) = \cos x$, $\forall x \in R$. Show that f is neither one-one nor onto.

12. Let $X = \{1, 2, 3\}$ and $Y = \{4, 5\}$. Find whether the following subsets of $X \times Y$ are functions from X to Y or not.

(i) $f = \{(1, 4), (1, 5), (2, 4), (3, 5)\}$ (ii) $g = \{(1, 4), (2, 4), (3, 4)\}$

(iii) $h = \{(1,4), (2, 5), (3, 5)\}$ (iv) $k = \{(1,4), (2, 5)\}$.

13. If functions $f: A \to B$ and $g: B \to A$ satisfy $g \circ f = I_A$, then show that f is one-one and g is onto.

14. Let $f: R \to R$ be the function defined by $f(x) = \dfrac{1}{2 - \cos x}$, x R. Then, find the range of f.

15. Let n be a fixed positive integer. Define a relation R in Z as follows: a, b Z, aRb if and only if $a - b$ is divisible by n. Show that R is an equivalance relation.

16. If $A = \{1, 2, 3, 4\}$, define relations on A which have properties of being:

    (a)   reflexive, transitive but not symmetric

    (b)   symmetric but neither reflexive nor transitive

    (c)   reflexive, symmetric and transitive.

17. Let R be relation defined on the set of natural number N as follows:

    $R = \{(x, y): x$ N, y N, $2x + y = 41\}$. Find the domain and range of the relation R. Also verify whether R is reflexive, symmetric and transitive.

18. Given $A = \{2, 3, 4\}$, $B = \{2, 5, 6, 7\}$. Construct an example of each of the following:

    (a) an injective mapping from A to B

    (b) a mapping from A to B which is not injective

    (c) a mapping from B to A.

19. Give an example of a map

    (i)   which is one-one but not onto

    (ii) which is not one-one but onto

    (iii) which is neither one-one nor onto.

20. Let $A = R - \{3\}$, $B = R - \{1\}$. Let $f: A \to B$ be defined by $f(x) = \dfrac{x-2}{x-3}$

    x A. Then show that f is bijective.

21. Let $A = [-1, 1]$. Then, discuss whether the following functions defined on A are one-one, onto or bijective:

    (i) $f(x)$ $\dfrac{x}{2}$ (ii) $g(x) = |x|$

    (iii) $h(x)$ $x|x|$ (iv) $k(x) = x^2$

22. Each of the following defines a relation on N:

    (i) x is greater than y, x, y N

    (ii) $x + y = 10$, x, y N

    (iii) $x y$ is square of an integer x, y N

    (iv) $x + 4y = 10$ x, y N.

    Determine which of the above relations are reflexive, symmetric and transitive.

23. Let $A = \{1, 2, 3, \ldots 9\}$ and R be the relation in $A \times A$ defined by (a, b) R (c, d) if $a + d = b + c$ for $(a, b), (c, d)$ in $A \times A$. Prove that R is an equivalence relation and also obtain the equivalent class $[(2, 5)]$.

24. Using the definition, prove that the function $f: A \to B$ is invertible if and only if f is both one-one and onto.

25. Functions $f, g: R \to R$ are defined, respectively, by $f(x) = x^2 + 3x + 1$, $g(x) = 2x - 3$, find

    (i) $f \circ g$ (ii) $g \circ f$ (iii) $f \circ f$ (iv) $g \circ g$

26. Let $*$ be the binary operation defined on Q. Find which of the following binary operations are commutative

   (i) $a * b = a - b$ $a, b \in Q$
   (ii) $a * b = a^2 + b^2$ $a, b \in Q$
   (iii) $a * b = a + ab$ $a, b \in Q$
   (iv) $a * b = (a - b)^2$ $a, b \in Q$

27. Let $*$ be binary operation defined on R by $a * b = 1 + ab,$ $a, b \in R.$ Then the operation $*$ is

   (i) commutative but not associative
   (ii) associative but not commutative
   (iii) neither commutative nor associative
   (iv) both commutative and associative

Multiple Choice Questions

Choose the correct answer out of the given four options in each of the Exercises from 28 to 47 (M.C.Q.).

28. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as aRb if a is congruent to b $a, b \in T.$ Then R is

   (A) reflexive but not transitive
   (B) transitive but not symmetric
   (C) equivalence
   (D) none of these

29. Consider the non-empty set consisting of children in a family and a relation R defined as aRb if a is brother of b. Then R is

   (A) symmetric but not transitive
   (B) transitive but not symmetric
   (C) neither symmetric nor transitive
   (D) both symmetric and transitive

30. The maximum number of equivalence relations on the set A = {1, 2, 3} are

   (A) 1
   (B) 2

   (C) 3
   (D) 5

31. If a relation R on the set {1, 2, 3} be defined by R = {(1, 2)}, then R is

   (A) reflexive
   (B) transitive
   (C) symmetric
   (D) none of these

32. Let us define a relation R in R as aRb if $a \geq b$. Then R is

   (A) an equivalence relation
   (B) reflexive, transitive but not symmetric
   (C) symmetric, transitive but not reflexive
   (D) neither transitive nor reflexive but symmetric.

33. Let A = {1, 2, 3} and consider the relation

   R = {1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1,3)}.

   Then R is

   (A) reflexive but not symmetric
   (B) reflexive but not transitive
   (C) symmetric and transitive
   (D) neither symmetric, nor transitive

34. The identity element for the binary operation $*$ defined on Q $\sim$ {0} as

   $a * b = \dfrac{ab}{2}$ $a, b \in Q \sim$ {0} is

   (A) 1
   (B) 0
   (C) 2
   (D) none of these

35. If the set A contains 5 elements and the set B contains 6 elements, then the number of one-one and onto mappings from A to B is

   (A) 720
   (B) 120

(C) 0   (D) none of these

36. Let $A = \{1, 2, 3, \ldots n\}$ and $B = \{a, b\}$. Then the number of surjections from A into B is

    (A) $^nP_2$ (B) $2^n - 2$
    (C) $2^n - 1$ (D) None of these

37. Let $f : \mathbf{R} \to \mathbf{R}$ be defined by $f(x) = \dfrac{1}{x}$, $x \in \mathbf{R}$. Then f is

    (A) one-one   (B) onto
    (C) bijective   (D) f is not defined

38. Let $f : \mathbf{R} \to \mathbf{R}$ be defined by $f(x) = 3x^2 - 5$ and $g : \mathbf{R} \to \mathbf{R}$ by $g(x) = \dfrac{x}{x^2 + 1}$

    Then $g \circ f$ is

    (A) $\dfrac{3x^2 - 5}{9x^4 - 30x^2 + 26}$ (B) $\dfrac{3x^2 - 5}{9x^4 - 6x^2 + 26}$

    (C) $\dfrac{3x^2}{x^4 + 2x^2 - 4}$ (D) $\dfrac{3x^2}{9x^4 + 30x^2 - 2}$

39. Which of the following functions from **Z** into **Z** are bijections?

    (A) $f(x) = x^3$ (B) $f(x) = x + 2$
    (C) $f(x) = 2x + 1$ (D) $f(x) = x^2 + 1$

40. Let $f : \mathbf{R} \to \mathbf{R}$ be the functions defined by $f(x) = x^3 + 5$. Then $f^{-1}(x)$ is

    (A) $(x + 5)^{\frac{1}{3}}$ (B) $(x - 5)^{\frac{1}{3}}$

    (C) $(5 - x)^{\frac{1}{3}}$ (D) $5 - x$

41. Let $f : A \to B$ and $g : B \to C$ be the bijective functions. Then $(g \circ f)^{-1}$ is

    (A) $f^{-1} \circ g^{-1}$ (B) $f \circ g$
    (C) $g^{-1} \circ f^{-1}$ (D) $g \circ f$

42. Let $f : \mathbf{R} - \left\{\dfrac{3}{5}\right\} \to \mathbf{R}$ be defined by $f(x) = \dfrac{3x + 2}{5x - 3}$. Then

    (A) $f^{-1}(x) = f(x)$ (B) $f^{-1}(x) = -f(x)$

    (C) $(f \circ f) x = -x$ (D) $f^{-1}(x) = \dfrac{1}{19} f(x)$

43. Let $f : [0, 1] \to [0, 1]$ be defined by $f(x) = \begin{cases} x, \text{if } x \text{ is rational} \\ 1 - x, \text{ if } x \text{ is irrational} \end{cases}$

    Then $(f \circ f) x$ is
    (A) constant   (B) $1 + x$
    (C) x (D) none of these

44. Let $f : [2, \infty) \to \mathbf{R}$ be the function defined by $f(x) = x^2 - 4x + 5$, then the range of f is

    (A) **R**   (B) $[1, \infty)$
    (C) $[4, \infty)$ (B) $[5, \infty)$

45. Let $f : \mathbf{N} \to \mathbf{R}$ be the function defined by $f(x) = \dfrac{2x - 1}{2}$ and $g : \mathbf{Q} \to \mathbf{R}$ be another function defined by $g(x) = x + 2$. Then $(g \circ f) \dfrac{3}{2}$ is

    (A) 1   (B) 1

(C) $\dfrac{7}{2}$ (B)   none of these

46. Let $f : \mathbf{R} \to \mathbf{R}$ be defined by

$$f(x) = \begin{cases} 2x : x > 3 \\ x^2 : 1 < x \leq 3 \\ 3x : x \leq 1 \end{cases}$$

Then $f(-1) + f(2) + f(4)$ is

(A)   9   (B)   14
(C)   5   (D)   none of these

47. Let $f : \mathbf{R} \to \mathbf{R}$ be given by $f(x) = \tan x$. Then $f^{-1}(1)$ is

(A) $\dfrac{\pi}{4}$ (B) $\{n\pi + \dfrac{\pi}{4} : n \in \mathbf{Z}\}$

(C)   does not exist   (D)   none of these