

S. B. Roll. No.....

APPLIED PHYSICS-I
1st Exam/Common/0102/May'25
(For 2023 Batch Onwards)

Duration: 3Hrs.

M.Marks:50

SECTION-A

Q1. Do as directed any nine of the following.

9x1=9

- i. CGS system stands for _____.
- ii. The dot product of two perpendicular vectors is _____.
- iii. The transfer of heat by the actual motion of the particles constituting the body is called _____.
- iv. The energy possessed by the body due to its motion is called _____.
- v. A vector can be divided by another vector. (T/F)
- vi. The rise/fall of the liquid in the capillary tube is due to surface tension. (T/F)
- vii. The radiation mode of heat transfer necessarily requires a material medium. (T/F)
- viii. One nanometer is equal to 10^{-9} m. (T/F)
- ix. Which of the following is not a fundamental physical quantity
a) Electric Current b) Mass c) Temperature d) Volume
- x. Work done by centripetal force is always
a) Zero b) Positive c) Negative d) None of these
- xi. The meniscus of mercury in the capillary tube is
a) Plane b) Concave c) Convex d) None of these
- xii. Which of the following is not a scale of temperature
a) Celsius b) Newton c) Fahrenheit d) Réaumur

SECTION-B

Q2. Attempt any five questions.

5x4=20

- a. What is the SI system? Give the names of all the units in the SI system.
- b. State parallelogram law of vector addition. Write the expression for the magnitude and the direction of the resultant.
- c. Friction is a necessary evil. Explain the statement.
- d. What is Potential Energy? Derive the expression for the Gravitational Potential Energy when a body of mass m is raised through a height h at a place with acceleration due to gravity g .
- e. What is Surface Tension? Give the experiments demonstrating surface tension.
- f. State and explain Stoke's law?
- g. Convert temperature of 100° F into Celsius scale.

SECTION-C

Q3. Attempt any three questions.

3x7=21

- i. a) Convert the density of 13.6 g/cm^3 into kg/m^3 using the method of dimensions. **4**
b) A wheel of radius 0.8 m is revolving with a speed of 16 m/s . Find its angular speed. **3**
- ii. Define Work. Explain positive work, negative work and zero work with examples.
- iii. Define Stress, Strain and Modulus of Elasticity. Give the expression of various moduli of elasticity.
- iv. What is cross product of two vectors? Give the properties of Cross Product.
- v. Derive the relationship between the coefficient of linear expansion (α), coefficient of surface expansion (β) and coefficient of volume expansion (γ).

S. B. Roll. No.....

APPLIED PHYSICS-I
1st Exam/Common/5752/May'25
(For 2018 Batch Onwards)

Duration: 3Hrs.

M.Marks:75

SECTION-A

Q1. a) Fill in the blanks.

15x1=15

- i. Dimensional formula of pressure is _____.
- ii. Temperature is a _____ quantity.
- iii. 1 H.P.=_____Watt.
- iv. If torque acting on a body is zero, then its _____ will not change.
- v. Change in length per unit original length is called _____ strain.

b) State True or False.

- vi. Dimensions of work & torque are same.
- vii. Impulse has same unit as force.
- viii. The kinetic friction is always greater than rolling friction.
- ix. Heat radiations travel in straight line.
- x. The velocity of light is maximum in air.

c) Multiple choice questions.

- xi. Thermal conductivity of handle of a utensil should be a) high b) low c) one d) infinite
- xii. Rain drops are spherical because of a) capillarity b) Surface tension c) Thermal Conductivity d) density.
- xiii. Conservation of energy means that energy can be a) Created not destroyed b) Destroyed not created c) Created as well as destroyed d) Neither created nor destroyed
- xiv. The number of significant figures in 0.071 is a) 1 b) 2 c) 3 d) 4
- xv. A body in uniform circular motion has constant a) Speed b) Velocity c) Acceleration d) Linear momentum

SECTION-B

Q2. Attempt any six questions.

6x5=30

- a. Convert the value of joule into ergs using dimensional equations.
- b. Convert 100°F into kelvin Scale and Celsius Scale
- c. Define Surface tension. Write its three applications.
- d. Define work. Write its types with one example of each.
- e. Differentiate between scalar and vector quantities.
- f. Show that $\vec{A} = 2i + 4j - k$ and $\vec{B} = 3i - 2j - 2k$ are perpendicular to each other.
- g. What are three modes of transfer of heat? Write one example of each.
- h. Friction is necessary evil. Explain.

SECTION-C

Attempt any three questions.

3x10=30

- Q3. a) State principle of conservation of energy. 2
- b) Show that for a freely falling body total mechanical energy remains constant. 8
- Q4. What is banking of roads? Why it is done? Derive expression of angle of banking. 2, 2, 6
- Q5. a) What is viscosity & coefficient of viscosity? Give dimensions of coefficient of viscosity. 2, 2, 2
- b) State Hooke's Law. Draw stress strain curve. 4
- Q6. a) Differentiate between Heat and Temperature. 4
- b) Define torque. Derive relation between torque and angular momentum. 6
- Q7. What is principle of Homogeneity of Dimensions? Give uses and limitations of Dimensional Analysis. 2, 3, 5

S. B. Roll. No.....

APPLIED CHEMISTRY
1st Exam/Common/0103/May'25
(For 2023 Batch Onwards)

Duration: 3Hrs.

M.Marks:50

SECTION-A

Q1. Do as directed any nine of the following.

9x1=9

- i. Define isotopes?
- ii. Write Electronic configuration of Chromium.
- iii. 1 ppm = _____^oCl
- iv. Gain of electrons is called _____
- v. Water gas is a combination of _____ & _____
- vi. Neutron was discovered by _____
- vii. Full form of PVC is _____
- viii. If n=3 ,possible values of l, m and s are- a) 3, 2, 0 b) 3, 3, +1/2 c) 2, 3, -1/2 d) 2, 2, -1/2
- ix. Nucleus of atom contains a) electrons b) Protons c) Neutrons d) both b & c
- x. Fe⁺² is called ferric ion. (T/F)
- xi. Nylon 66 is an example of condensation reaction. (T/F)
- xii. Chloride and Sulphate of Calcium & Magnesium are responsible for permanent hardness. (T/F)

SECTION-B

Q2. Attempt any five questions.

5x4=20

- a. Define Pauli's exclusion rule and Heisenberg uncertainty rule?
- b. What are characteristics of drinking water?
- c. Differentiate between electrolyte and non electrolytes.
- d. What are characteristics of good fuel?
- e. Define Degree of polymerization, nanotechnology, Molarity and molality.
- f. What is buffer solution and types of buffer solution?
- g. What are Faraday's first and second law of electrolysis?

SECTION-C

Attempt any three questions.

3x7=21

- Q3. a)** Write chemical formula and find molecular mass of following. **4**
 (Ca=40 amu, O = 16 amu ,H =1 amu ,S =32 amu) i) Calcium Hydroxide ii) Sulphuric acid
- b)** Give differences between ionic and covalent compounds? **3**
- Q4.** What are features and drawbacks of Bohr Atomic Model? **7**
- Q5.** Explain removal of hardness of water by Ion exchange Process with figure? **7**
- Q6. a)** Define i) TAN ii) Viscosity Index iii) Flash point iv) Fire Point v) Cloud Point **5**
- b)** Give difference between octane and cetane number **2**
- Q5. a)** Calculate pH of 0.01 M HCl. **2**
- b)** Give difference between sigma and pi bond. **3**
- c)** Give difference between Primary and Secondary Cell. **2**

S. B. Roll. No.....

APPLIED CHEMISTRY-I
1st Exam/Common/6052/May'25
(For 2018 Batch Onwards)

Duration: 3Hrs.

M.Marks:75

SECTION-A

Q1. a) Fill in the blanks.

15x1=15

- i. Chemical symbol of zinc is _____
- ii. Shape of methane molecule is _____
- iii. The reaction in which both oxidation and reduction takes place is known as _____
- iv. IUPAC name of $\text{CH}_3\text{-CH}_3$ is _____
- v. General formula of alkanes is _____
- vi. Pure substance containing only one kind of atoms is called _____
- vii. Electron was discovered by _____
- viii. The pH of pure water is _____
- ix. _____ hardness of water cannot be removed by boiling.
- x. Reducing agent _____ electrons.

b) State True or False.

- xi. Anions are negatively charged particles.
- xii. There are seven periods in the periodic table.
- xiii. Hard water does not form scales and sludge in the boiler.
- xiv. Sterilization of water is generally done by chlorination.
- xv. Reduction is gain of electrons.

SECTION-B

Q2. Attempt any ten questions.

10x3=30

- a. Define isotopes and isobars.
- b. Give any three disadvantages of using hard water for industrial purposes.
- c. Give the IUPAC nomenclature of $\text{CH}_3\text{-CH}_3$, $\text{CH}_3\text{-CH}_2\text{-Cl}$ and $\text{CH}_3\text{-NH}_2$.
- d. Calculate the percentage composition of Na and Cl in NaCl. Given Atomic mass of Na = 23 amu, Cl = 35.5 amu.
- e. Define molality. Give its units.
- f. Define pH. What is the pH of an acidic solution?
- g. Define solute and solvent and explain these with the help of an example.
- h. What are the qualities that drinking water must have?
- i. Define electrolytes. Give two examples.
- j. Define catenation. How it is helpful in making large number of organic compounds?
- k. Give the functional group of alcohols, Aldehydes and carboxylic acids.
- l. Explain the terms oxidation and reduction.
- m. Define Aufbau's and Pauli's exclusion principle.
- n. Differentiate between orbit and orbital.

SECTION-C

Q3. Attempt any three questions.

3x10=30

- i. State the postulates of Bohr's model of atom. What are the limitations of Bohr's model of atom?
- ii. What is hard water and soft water? Give one method to remove permanent hardness.
- iii. What are the essentials of a chemical equation? Balance the following chemical equations:
 - a) $\text{Fe}_3\text{O}_4 + \text{H}_2 \longrightarrow \text{Fe} + \text{H}_2\text{O}$
 - b) $\text{KMnO}_4 + \text{H}_2\text{SO}_4 \longrightarrow \text{K}_2\text{SO}_4 + \text{MnSO}_4 + \text{H}_2\text{O} + \text{O}$
 - c) $\text{H}_3\text{PO}_3 \longrightarrow \text{H}_3\text{PO}_4 + \text{PH}_3$
- iv. Define hybridization. Explain the shape of CH_4 , BF_3 and BeCl_2 on the basis of hybridization.
- v. Define electrolysis. Give a detailed account of Faraday's laws of electrolysis.

CHB

S. B. Roll. No.....

APPLIED CHEMISTRY
1st Exam/Common/0103/May'25
(For 2023 Batch Onwards)

Duration: 3Hrs.

M.Marks:50

SECTION-A

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- viii. If n=3, possible values of l, m and s are- a) 3, 2, 0 b) 3, 3, +1/2 c) 2, 3, -1/2 d) 2, 2, -1/2
- ix. Nucleus of atom contains a) electrons b) Protons c) Neutrons d) both b & c
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- xii. Chloride and Sulphate of Calcium & Magnesium are responsible for permanent hardness. (T/F)

SECTION-B

5x4=20

Q2. Attempt any five questions.

- a. Define Pauli's exclusion rule and Heisenberg uncertainty rule?
- b. What are characteristics of drinking water?
- c. Differentiate between electrolyte and non electrolytes.
- d. What are characteristics of good fuel?
- e. Define Degree of polymerization, nanotechnology, Molarity and molality.
- f. What is buffer solution and types of buffer solution?
- g. What are Faraday's first and second law of electrolysis?

SECTION-C

3x7=21

Attempt any three questions.

- Q3. a) Write chemical formula and find molecular mass of following. 4
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- b) Give differences between ionic and covalent compounds? 3
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- Q6. a) Define i) TAN ii) Viscosity Index iii) Flash point iv) Fire Point v) Cloud Point 5
- b) Give difference between octane and cetane number 2
- Q5. a) Calculate pH of 0.01 M HCl. 2
- b) Give difference between sigma and pi bond. 3
- c) Give difference between Primary and Secondary Cell. 2

S. B. Roll. No.....

APPLIED MATHEMATICS-I
1st Exam/Common/0101/May'25
(For Batch 2023 Onwards)

Duration: 3Hrs.

M.Marks:50

SECTION-A

Q1. Do as directed any nine of the following.

9x1=9

- i. The modulus of $\sqrt{3}+i$ is a) 3 b) 1 c) 2 d) 4
- ii. If ${}^nC_6 = {}^nC_4$ then n is equal to a) 10 b) 12 c) 24 d) 2
- iii. The number of terms in the expansion of $(1-x)^{-5}$ is a) 4 b) 5 c) 6 d) infinite
- iv. The value of $\sin\frac{\pi}{6}$ is a) 0 b) $\frac{1}{2}$ c) $\frac{\sqrt{3}}{2}$ d) 1
- v. The angle -1837° lies first quadrant. (T/F)
- vi. The value of $\cos\frac{\pi}{2} + i \sin\frac{\pi}{2} = 0$ (T/F)
- vii. If two lines are parallel then their slopes are equal. (T/F)
- viii. $0! = 1$ (T/F)
- ix. If the end points of the diameter of the circle are (2,3)&(6,5) then centre of the circle is _____
- x. A complex number is a combination of real and _____ parts.
- xi. If a square matrix A has two identical rows and columns, then $\det A$ _____
- xii. $\sin C + \sin D =$ _____

SECTION-B

Q2. Attempt any five questions.

5x4=20

- a. Resolve into partial fraction $\frac{2x+3}{(x-2)(x+3)}$
- b. If ${}^{n+2}C_8 : {}^{n-2}P_4 = 57 : 16$, then find n
- c. Find the co-efficient of x^{18} in the expansion of $(x^2 + \frac{3\alpha}{x})^{15}$
- d. Prove that $\tan 28^\circ = \frac{\cos 17^\circ - \sin 17^\circ}{\cos 17^\circ + \sin 17^\circ}$
- e. Show that $(\cos \alpha + \cos \beta)^2 + (\sin \alpha + \sin \beta)^2 = 4 \cos^2 \frac{(\alpha - \beta)}{2}$
- f. If the points (1, 2), (-2, -10) and (3, p) are collinear, then find the value of p.
- g. Prove that the straight line whose intercepts on axis of x and y are respectively -2 and 3 passes through the point (2, 6).

SECTION-C

Q3. Attempt any three questions.

3x7=21

- i. Find the equation of the circle passing through the points (5,7), (6,6) and (2,-2).
- ii. If x is so small that its square and higher powers may be neglected then show that $\frac{\sqrt{9+7x} - (16+3x)^{1/4}}{(4+5x)} \cong \frac{1}{4} - \frac{17x}{384}$ (approx)
- iii. Solve by Cramer's rule
 $3x+y+2z = 3$
 $2x-3y-z = -3$
 $x+2y+z = 4$
- iv. Two pillars of equal height stand on the either side of a roadway which is 30mt wide, at a point in the roadway between the pillars, the angles of elevations of the tops of the pillars are 30° and 60° . Determine their height and position of the point.
- v. Solve the following linear programming problem graphically.
 Minimise and maximise . $Z = x+2y$ Subject to
 $x+2y \geq 100$, $2x-y \leq 0$, $2x+y \leq 200$; $x, y \geq 0$.

S. B. Roll. No.....

APPLIED MATHEMATICS-I
1st Exam/Common/2952/May'25
(For 2018 Batch Onwards)

Duration: 3Hrs.

M.Marks:75

Note: Calculator (Simple or Scientific) is not allowed.

SECTION-A

Q1. a) Choose the correct answer.

15x1=15

- i. Find the conjugate of $-1 - i$ a) $-1 + i$ b) $1 - i$ c) $1 + i$ d) $\sqrt{2}$
ii. Number of terms in the expansion of $(2x - 3y)^5$ is a) 5 b) 4 c) 6 d) 15
iii. The slope of the equation $3x + 2y - 5 = 0$ a) $-3/2$ b) $2/3$ c) $3/2$ d) $-2/3$
iv. Value of $\cos 450^\circ$ is a) 1 b) -1 c) 0 d) $1/2$
v. Polar co-ordinates of (1,-1) are. a) $(\sqrt{2}, 3\pi/4)$ b) $(\sqrt{2}, \pi/4)$ c) $(\frac{1}{\sqrt{2}}, \pi/2)$ d) $(\frac{1}{\sqrt{2}}, \pi/2)$

b) State True or False.

- vi. Factorial of negative integer is defined
vii. The value of determinant is not changed when rows and columns are inter changed.
viii. Three points are said to be collinear if the area of Δ , taking these points as vertices, is one.
ix. The multiplications of two matrices may not be commutative.
x. $\sin(180 - \theta) = \sin\theta$

c) Fill in the blank.

- xi. 1 right angle = _____ radian
xii. The binomial expansion $(6 - 3x)^{-1/2}$ is valid when _____
xiii. If ${}^nC_6 = {}^nC_4$ then n is equal to _____
xiv. Radius of circle $x^2 + y^2 - 8x - 16y + 78 = 0$ is _____
xv. Two lines are parallel if their slope is _____

SECTION-B

Q2. Attempt any six questions.

6x5=30

- a. Find the modulus and argument of complex number $\sqrt{3} + i$
b. Resolve $\frac{x+4}{(x-4)(x^2-3x+2)}$ into partial Fraction.
c. Find the constant term in the expansion $(\frac{4x^2}{3} - \frac{3}{2x})^9$
d. Prove $\tan 3A - \tan 2A - \tan A = \tan 3A \tan 2A \tan A$.
e. Prove that $\frac{\sin 3A}{\sin A} - \frac{\cos 3A}{\cos A} = 2$
f. If the point (1,2), (-2,-10) and (3,P) are collinear, then find the value of P
g. Find the acute angle between the lines whose equations are
 $3x + 4y + 7 = 0, 4x - 3y + 5 = 0$
h. Solve the equation $\text{Log}(x+4) - \text{Log}7 = 3\text{Log}2 - \text{log}(x+5)$
i. Find the inverse of the matrix $\begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$

SECTION-C

Q3. Attempt any three questions.

3x10=30

- i. Find the equation of the circle passing through the points (1,1) (2,-1) and (3,2).
ii. For what value of k, are the three lines $x - 2y + 1 = 0; 2x - 5y + 3 = 0$ and $5x - 9y + k = 0$ are concurrent?

S. B. Roll. No.....

- iii. A tower subtends an angle of 60° at a point on the same level as the foot of the tower and at a second point 20 meters above the first the angle of depression of the tower 30° . Find the height of the tower.

iv. If x is so small its square and higher powers can be neglected, then show that.

$$\frac{\sqrt{1-3x} + (1-x)^{5/3}}{(4-x)^{1/2}} \cong 1 - \frac{35}{24}x$$

- v. Using Cramer's rule to solve the system of equations.

$$2x - y + 3z = 1$$

$$x + 2y - z = 2$$

$$5y - 5z = 3$$