

**SYLLABUS AND MODEL QUESTIONS FOR DIFFERENT
PROGRAMMES UNDER SCHOOL OF SCIENCE**

(These questions are representative samples only, not complete question set. Candidates are requested to see the 'Syllabus' for reference).

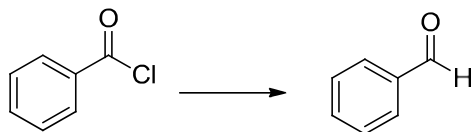
Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Integrated M.Sc. in Chemistry/Integrated B.Sc. B.Ed. in Chemistry

1. Higher Secondary Chemistry Syllabus (AHSEC/ CBSE/ or equivalent)
2. Basics of other branches of science like Physics, Biology, Mathematics etc.

Model Questions

1. Which one of the following organic acids does not possess $-\text{CO}_2\text{H}$ group?
(A) Citric acid
(B) Picric acid
(C) Benzoic acid
(D) Fumaric acid
2. Which nucleobase is not found in RNA?
(A) Adenine
(B) Cytosine
(C) Uracil
(D) Thymine
3. Conversion of salicylic acid to aspirin is achieved by:
(A) Acetylation
(B) Hydrolysis
(C) Nitration
(D) Bromination
4. The most appropriate reagent(s) for following reaction is (are):



- (A) Pd-C, H_2
- (B) H_2 , Pd- BaSO_4
- (C) LiAlH_4
- (D) NaBH_4

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M.Sc. in Chemistry

Inorganic Chemistry, Quantum Chemistry & Chemical Bonding, Organic Chemistry, Physical Chemistry, Spectroscopy from Undergraduate level curriculum of all leading Indian Universities.

Model Questions

1. Kyoto protocol is:
(A) to mitigate the climate change
(B) to check depletion of ozone layer
(C) to check soil erosion
(D) to preserve water resource
2. Which of the following hormones is secreted by the pituitary gland
(A) Insulin
(B) Glucagon
(C) Oxytocin
(D) Thyroxine
3. 18 g of glucose $C_6H_{12}O_6$ is dissolved in 1 kg of water in a saucepan. At what temperature will the water boil when pressure is 1.013 bar? (K_b for water is $0.52 \text{ K kg mol}^{-1}$, molar mass of glucose is 180 g.mol^{-1})
(A) 373.202 K
(B) 373.15 K
(C) 298 K
(D) 300 K
4. Brownian movement is due to
(A) external influence of dispersed phase
(B) gravitational and electrical field
(C) bombardment of the dispersed particles by the molecules of dispersion particles
(D) attraction and repulsion between charges on the colloidal particles

Syllabus for Tezpur University Entrance Examinations (TUEE) 2020

PhD in Chemical Sciences

Organic Chemistry, Inorganic Chemistry, Physical and Quantum Chemistry, Polymer Chemistry, Analytical Chemistry, Spectroscopy, Interdisciplinary topics from post graduate level curriculum of all leading Indian Universities.

Model Questions

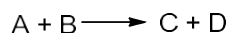
1. The acidity of normal rainwater is due to

- (A) SO₂
- (B) CO₂
- (C) CO
- (D) H₂

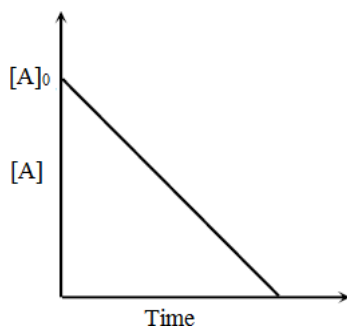
2. Which method is used to determine enantiomeric excess (ee) values of chiral molecules?

- (A) IR Spectroscopy
- (B) Chiral HPLC
- (C) Mass Spectroscopy
- (D) UV Spectroscopy

3. In the reaction,



The time taken for 75% reaction of *B* is twice the time taken for 50% reaction of *B*. The concentration of *A* varies with reaction time as shown in the figure. The overall order of the reaction is



- (A) 2
- (B) 3
- (C) 0
- (D) $1/2$

4. An acidic buffer contains

- (A) weak base and its conjugate acid.
- (B) weak acid and its conjugate base.
- (C) Strong base and its conjugate acid.
- (D) Strong acid and its conjugate base.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M.Sc. in Environmental Science

Botany, Zoology, Agriculture, Physics, Chemistry, Mathematics, Statistics, Earth and Environmental Science from Undergraduate level curriculum of Indian Universities.

Model Questions

1. In which of the following animal haemocyanin pigment is found?
 - (A) Annelida
 - (B) Echinodermata
 - (C) Insecta
 - (D) Mollusca
2. Which one of the following pairs of structures distinguishes a nerve cell from other type of cell?
 - (A) Vacuoles and fibres
 - (B) Flagellum and medullary sheath
 - (C) Nucleus and mitochondria
 - (D) Perikaryon and dendrites
3. Which of the following pairs of ions are isoelectronic?
 - (A) Na^+ , Cl^-
 - (B) K^+ , Cl^-
 - (C) Na^+ , Br^-
 - (D) Ba^{2+} , Br^-
4. ENSO is referred to the
 - (A) Warming of sea surface temperature (SST).
 - (B) Combined action of collapse of Walker circulation and warming of SST.
 - (C) Collapse of Walker circulation.
 - (D) Strengthening of Hadely circulation.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

PhD in Environmental Science

Botany, Zoology, Agriculture, Physics, Chemistry, Mathematics, Statistics, Earth and Environmental Science from master's level curriculum of Indian Universities.

Model Questions

1. For the quadratic equation $2x^2 - 3x + 1 = 0$, the sum of two roots equals
 - (A) 1.5
 - (B) -1.5
 - (C) -5.1
 - (D) 5.1
2. Neutral temperature of a thermo-couple is the temperature at which thermo emf is
 - (A) Maximum.
 - (B) Minimum.
 - (C) zero.
 - (D) Changes Sign.
3. For any two set A and B, $A \cap (B - A) =$
 - (A) A
 - (B) B
 - (C) Null Set
 - (D) A-B
4. A train of length 100 metres moving with a speed of 20 metres/sec crosses a bridge of length 1 km. The time taken by the train to cross the bridge is
 - (A) 45 seconds.
 - (B) 50 seconds.
 - (C) 55 seconds.
 - (D) 60 seconds.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020
Integrated M. Sc. in Mathematics/Integrated B.Sc. B.Ed. in Mathematics

Numbers and sets, relations and functions, polynomial and transcendental equations, matrices and determinants, system of linear equations, sequences and series, permutation and combination, binomial theorem, complex numbers, logarithm, mathematical induction, inequalities, mathematical logic. Trigonometric functions, inverse trigonometric functions, solution of trigonometric equations. Straight line, conic section, planes in 2D geometry. Elements of 3D geometry, direction cosine and direction ratio, distance and section formula. Limits, continuity, differentiability. Derivatives of functions, applications of derivatives. Indefinite and definite integrals, applications. Differential equations: preliminaries, solution of first order ordinary differential equation. Algebra of vectors, scalar and vector product, triple product of vectors. Mean, Median, Mode, Variants, Standard Deviation, Frequency distribution. Classical definition of Probability, random variable, conditional probability, Baye's Theorem, Binomial, Poisson and Normal distribution. Basics of linear programming, graphical methods of solutions of Linear Programming Problems (LPP).

Model questions

1. Let $A(2, -3)$ and $B(-2, 1)$ be vertices of a triangle ABC . If the centroid of this triangle moves on the line $2x + 3y = 1$, then the locus of the vertex C is the line
 - (A) $2x + 3y = 9$.
 - (B) $2x - 3y = 7$.
 - (C) $3x + 2y = 5$.
 - (D) $3x - 2y = 3$.

2. If $f(1) = 1$, $f'(1) = 2$, then $\lim_{x \rightarrow 1} \frac{\sqrt{f(x)} - 1}{\sqrt{x} - 1}$ is
 - (A) 2.
 - (B) 4.
 - (C) 1.
 - (D) 0.5

3. The letters of the word $COCHIN$ are permuted and all permutations are arranged in an alphabetical order as in an English dictionary. The number of words that appear before the word $COCHIN$ is
 - (A) 36
 - (B) 192
 - (C) 96
 - (D) 48

4. If x is the first term of an infinite G.P., whose sum is 10, then

(A) $0 < x < 10$.

(B) $-5 < x < 5$.

(C) $-10 < x < 10$.

(D) $x \geq 10$.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

PhD in Mathematical Sciences

Linear Algebra, Abstract Algebra, Real Analysis, Complex Analysis, Functional Analysis, Topology, Ordinary and Partial Differential Equations, Numerical Analysis, Measure Theory, Classical Mechanics, Probability and Statistics, Mathematical Programming, Number Theory.

Model Questions

1. How many real root does the equation have?
(A) 17
(B) 1
(C) 13
(D) 7
2. If $S = \{m+n\sqrt{2} : m, n \text{ are integers}\}$, then the topological closure of S is
(A) S
(B) $\{m+n\sqrt{2} : m, n \text{ are rational numbers}\}$.
(C) the set of rational numbers.
(D) the set of real numbers
3. For a sequence of real numbers $\{x_n\}$, which of the following is true?
(A) If $\{x_{2n}\}$ and $\{x_{2n+1}\}$ are convergent then $\{x_n\}$ is also convergent.
(B) If $\{x_{3n}\}$, $\{x_{3n+1}\}$ and $\{x_{3n+2}\}$ are convergent then $\{x_n\}$ is also convergent.
(C) If $\{x_{2n}\}$, $\{x_{2n+1}\}$ and $\{x_{3n}\}$ are convergent then $\{x_n\}$ is also convergent.
(D) If $\{x_{2n}\}$, $\{x_{2n+1}\}$ and $\{x_{2n-1}\}$ are convergent then $\{x_n\}$ is also convergent.
4. If a square matrix of order 10 has exactly 4 distinct eigenvalues, then the degree of its minimal polynomial is
(A) at least 4.
(B) at most 4.
(C) at least 6.
(D) at most 6.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

PhD in Molecular Biology and Biotechnology

Master (MSc/MTech)/B.Sc (Graduation) level Life Science (includes Biotechnology, Botany, Zoology, Microbiology, Biochemistry, Cell Biology, Physiology, Genetics etc.), basic bioinformatics and statistics, and Higher Secondary level Physics, Chemistry and Mathematics.

Model Questions

1. *Azadirachta indica* (Neem) belongs to the family
 - (A) Meliaceae.
 - (B) Euphorbiaceae.
 - (C) Fabaceae.
 - (D) Poaceae.

2. Porogamy is
 - (A) Entry of pollen tube into the ovule through chalaza.
 - (B) Entry of pollen tube into the ovule through micropyle.
 - (C) Entry of pollen tube into the ovule through integuments.
 - (D) Entry of pollen tube into the style and stigma.

3. Pollination in *Vallisneria* is carried out by
 - (A) Air.
 - (B) Birds.
 - (C) Insects.
 - (D) Water.

4. Which of the following is a fungicide?
 - (A) Dichlorodiphenyltrichloroethane (DDT)
 - (B) Bordeaux mixture
 - (C) 2,4-Dichlorophenoxyacetic acid (2,4 D)
 - (D) Penicillin

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Integrated M.Sc. in Life Science

Higher secondary level (AHSEC/CBSE/ or equivalent) Biology, Physics, Chemistry, Mathematics, basic Computer Science.

Model Questions

1. Enzymes act by
 - (A) Increasing the activation energy for a reaction.
 - (B) Lowering the activation energy for a reaction.
 - (C) Increasing the free energy of the system.
 - (D) Decreasing the free energy of the system.

2. The α -helix in proteins is formed due to
 - (A) Intramolecular hydrogen bond.
 - (B) Intermolecular hydrogen bond.
 - (C) Van der Waals interactions between amino acids.
 - (D) Ionic interactions.

3. Which of the following sequence correctly describes the cell cycle?
 - (A) G1 phase: G2 phase: Mitosis: Cytokinesis.
 - (B) Mitosis: G1 phase: G2 phase: Cytokinesis.
 - (C) Cytokinesis: Mitosis: S phase: G1 phase: G2 phase.
 - (D) S phase: G2 phase: Mitosis: Cytokinesis: G1 phase.

4. Bile contribution to digestion is
 - (A) Nucleic acid metabolism.
 - (B) Protein digestion.
 - (C) Emulsification of dietary lipids.
 - (D) Carbohydrate digestion.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M.Sc. in Molecular Biology and Biotechnology

B.Sc. level Life Science (includes Biotechnology, Botany, Zoology, Microbiology, Biochemistry, Cell Biology, Physiology, Genetics etc.) and higher secondary level Physics

Model Questions

1. Competitive inhibitors of enzymes are those which
 - (A) Do not bind to enzymes.
 - (B) Bind to substrate.
 - (C) Bind to substrate binding site.
 - (D) Bind to sites other than substrate binding site.

2. Honey bees show which type of population distribution?
 - (A) Clumped
 - (B) Random
 - (C) Nearly uniform
 - (D) Lonely predator

3. Molecular weight of NaCl is 58.44. To prepare 250 ml 4M NaCl solution how much NaCl will be required?
 - (A) 233.76 gm
 - (B) 584.4 gm
 - (C) 58.44 gm
 - (D) 14.61 gm

4. Which of the following is an active transport process?
 - (A) Osmosis
 - (B) Diffusion
 - (C) Glucose uptake in intestine
 - (D) Facilitated diffusion

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Integrated B.Sc. B.Ed. in Physics/ Integrated M.Sc. in Physics

Higher Secondary Syllabus (AHSEC/ CBSE/or equivalent) of Physics.

Model Questions

1. You are driving a car along a straight road for 8.4 km at 70 km/h, at which point the car runs out of fuel and stops. Over the next 30 min, you walk another 2.0 km farther along the road to a fuel station. The average velocity from the beginning of your drive to your arrival at the station is
 - (A) 10 Km/h.
 - (B) 12 Km/h.
 - (C) 15 Km/h.
 - (D) 17 Km/h.
2. A point object is 24 cm above the surface of water. $\mu=4/3$ in a lake. A fish inside the water will observe the object to be at a point
 - (A) 32 cm above the surface.
 - (B) 18 cm above the surface.
 - (C) 6cm below the surface.
 - (D) 6 cm above the surface.
3. According to Newton's law of gravitation, the force between two bodies is
 - (A) directly proportional to masses of the bodies.
 - (B) inversely proportional to the distances between the bodies
 - (C) directly proportional to the distance between the bodies.
 - (D) inversely proportional to masses of the bodies.
4. Mass of a bronze block is 1 kg. To raise the temperature of this block from 25 °C to 125 °C, heat required is 40000 J. The specific heat of block in J/kg °C is
 - (A) 200
 - (B) 500
 - (C) 600
 - (D) 400

Syllabus for Tezpur University Entrance Examination (TUEE) 2020
M.Sc. in Physics

B.Sc. level syllabus of any Indian University (Classical Mechanics, Properties of matter, Quantum Mechanics, Atomic Physics, Solid State Physics, Nuclear Physics, Mathematical Physics, Thermodynamics and Statistical Physics, Electricity and Magnetism, Electronics)

Model Questions

1. Inter-planar spacing (in Angstrom) of crystal planes denoted by Miller indices (111) for which X-rays of wavelength 1.54 Angstrom incident at angle 19.2 degrees satisfy Bragg's law for X-Ray diffraction is

- (A) 2.34
- (B) 9.36
- (C) 4.05
- (D) 6.56

2. An astronomer measures the wavelength of a hydrogen spectral line coming from a distant quasar to be 460.9 nano-metre (nm) whereas the same spectral line of hydrogen is measured to be 121.6 nm using hydrogen discharge tube. The quasar going away from earth radially has a speed (in terms of speed of light c)

- (A) $0.6c$
- (B) $0.96c$
- (C) $0.87c$
- (D) $0.24c$

3. An electrical cable of copper has just one wire of radius 9 mm. Its resistance is 5W. The single cable is replaced by 6 different well insulated copper wires each of radius 3 mm.

The total resistance of the cable now will be equal to:

- (A) 7.5 W
- (B) 45 W
- (C) 90 W
- (D) 270 W

4. A 5 MeV alpha particle approaches a gold ($Z=79$) nucleus with an impact parameter of 2.6×10^{-13} m. The angle of scattering of alpha particle will be

- (A) 20°
- (B) 45°
- (C) 90°
- (D) 10°

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

PhD in Physics

M.Sc. Physics syllabus of any Indian University (Quantum Mechanics, Classical Mechanics, Mathematical Physics, Condensed matter Physics, Statistical Physics, Atomic and Molecular Physics, Nuclear and Particle Physics, Astrophysics, Electrodynamics, Electronics)

Model Questions

1. A system consists of N number of particles, $N \gg 1$. Each particle can have only one of the two energies E_1 or $E_1 + \epsilon$. If the system is in equilibrium at a temperature T , the average number of particles with energy E_1 is

(A) $\frac{N}{2}$

(B) $\frac{N}{e^{\epsilon/kT} + 1}$

(C) $\frac{N}{e^{-\epsilon/kT} + 1}$

(D) $N e^{-\epsilon/kT}$

2. The trace of a 2×2 matrix is 4 and its determinant is 8. If one of the eigenvalues is $2(1 + i)$, the other eigenvalue is

(A) $2(1 - i)$

(B) $2(1 + i)$

(C) $(1 + 2i)$

(D) $(1 - 2i)$

3. A proton from outer space is moving towards earth with velocity $0.99c$ as measured in earth's frame. A spaceship, traveling parallel to the proton, measures proton's velocity to be $0.97c$.

The approximate velocity of the spaceship, in the earth's frame, is

- (A) $0.2c$
- (B) $0.3c$
- (C) $0.4c$
- (D) $0.5c$

4. A satellite moves around the earth in a circular orbit of radius R centered at the earth. A second satellite moves in an elliptic orbit of major axis $8R$, with the earth at one of the foci. If the former takes 1 day to complete a revolution, the latter would take

- (A) 21.6 days
- (B) 8 days
- (C) 3 hours
- (D) 1.1 hour
