



# UPES

## *Topic List and Sample Items – B. Tech*

## **Topic List:**

### **Sections in the test:**

English Language and Comprehension, Mathematics, Physics, Chemistry, and Current Affairs

### **Topic list:**

- **English Language and Comprehension**
  - Reading Comprehension
  - Tenses & Gerunds
  - Articles & Preposition
  - Speech
  - Sentence Correction
  - Synonyms & Antonyms
  - Vocabulary
  - Spelling
  - Phrases & Idioms
  - Sequencing
  
- **Mathematics**
  - Algebra
  - Equations
  - Number System
  - Trigonometry
  - Vector Algebra
  - Mensuration
  - Venn Diagram
  - Probability
  - Mathematical modelling
  - Coordinate Geometry
  - Calculus
  
- **Physics**
  - Units and Vectors
  - Kinematics and Dynamics
  - Centre of mass
  - Friction
  - Rotary motion
  - Elasticity and Surface Tension
  - Expansion and Thermodynamics
  - Thermal radiation
  - Sound
  - Optics (Geo and Physical)
  - Magnetism
  - Electrostatics and Current electricity
  - Atomic and Nuclear physics
  - Semi-Conductors

- **Chemistry**

- Atomic structure and Chemical bonding
- Gaseous state
- Chemical Equilibrium & Kinetics
- Electrochemistry and Solution
- Periodic Classification of elements
- Alkyl Halides, Alcohol & ethers
- Hydrocarbons
- Aldehydes and Ketones, Carboxylic Acids
- Nitrogen Compounds
- Alkali & Alkaline Earth Metals, Hydrogen & its compound, Noble gases
- Nuclear Chemistry

- **Current Affairs**

- History, Geography
- Polity, Economics
- General Science, Science and technology
- Ecology, Personalities
- National Events
- International Events

**Sample Items:**

**English Language and Comprehension**

Q.1 Fill in the blank with the most suitable option.

He will be leaving for London \_\_\_\_\_ Monday.

- A. on
- B. by
- C. before
- D. Any of the mentioned options

Q.2 Fill in the blank with the most suitable option.

Harry \_\_\_\_\_ Sam yesterday.

- A. meet
- B. had met
- C. have met
- D. has met

Q.3 From the given alternatives, choose the one which best expresses the given sentence in Direct/Indirect speech.

Diana told to Samuel, "You did great work".

- A. Diana appreciated Samuel that he did great work
- B. Diana appreciated Samuel that he has done great work
- C. Diana appreciated Samuel that he is doing great work
- D. Diana appreciated Samuel about the great work he has done

- Q.4 Given below are sentences which when arranged logically form a coherent passage. Choose the option which gives the correct sequence.
- (1) The sons believed that the treasure was buried in that spot
  - (2) They dug the specific spot so deeply, got nothing but water
  - (3) They worked very hard and dug that spot. They could not find any treasure box in the first few hours
  - (4) They decided to dig a spot in their land that remained a bit different from the rest of the area
- A. 4, 1, 3, 2  
B. 4, 3, 2, 1  
C. 4, 2, 1, 3  
D. 4, 1, 2, 3
- Q.5 In the following sentence, some part or whole sentence is underlined. Below are given four ways of phrasing the underlined part. Select the answer from among the choices which produce the most effective sentence, one that is clear and exact.
- He is far more intelligent than any human living.
- A. He is far more intelligent than any human living  
B. He is so far more intelligent than any human living  
C. He is far more intelligent than any other human living  
D. He is so far more intelligent than any other human living
- Q.6 From the given options, choose the word that is **spelt incorrectly**.
- A. Aberant  
B. Admonish  
C. Avert  
D. Alleviate
- Q.7 Fill in the blank with the most suitable option.
- He was very friendly with the press and it really \_\_\_\_\_ him even for what he did not achieve.
- A. condemned  
B. glorified  
C. faulty  
D. mock

Q.8 Choose the word **closest in meaning** to the word given below:

FEIGN

- A. Pretend
- B. Honest
- C. Truth
- D. Gentle

Q.9 Choose the option which brings out the meaning of the idiom/phrase most appropriately.

To turn one's coat

- A. To flip the side of a coat
- B. To help the needy
- C. To change affiliation
- D. To get ready for a party

Q.10 For the given question, choose the alternative which best expresses the sentence in Active/Passive voice.

A company has been managed by me since 2004.

- A. I has managed a company since 2004.
- B. I have managed a company since 2004.
- C. A company has managed me since 2004.
- D. I have been managed a company since 2004.

**Mathematics**

Q.1 Determine:

$$\lim_{x \rightarrow \infty} (\sqrt{x} (\sqrt{x+c} - \sqrt{x}))$$

- A.  $c/2$
- B.  $c/4$
- C.  $c/3$
- D.  $c$

Q.2 From the top and bottom of a building of height "h", the angles of elevation of the top of a tower are " $\alpha$ " and " $\beta$ " respectively. Find the height of the tower.

- A.  $h \tan \beta / (\tan \alpha + \tan \beta)$
- B.  $h \tan \beta / \tan \alpha$
- C.  $h \tan \beta / (\tan \beta - \tan \alpha)$
- D. None of the mentioned options

Q.3 If the radii of two concentric circles are 18 cm and 17 cm, respectively, then the area of the circulating ring will be:

- A.  $106 \text{ cm}^2$
- B.  $110 \text{ cm}^2$
- C.  $102 \text{ cm}^2$
- D.  $104 \text{ cm}^2$

Q.4 If the difference of squares of two consecutive numbers is 93, then determine the larger number.

- A. 46
- B. 47
- C. 45
- D. 48

Q.5 How many four-letter words can be formed out of the letters of the word "PINEAPPLES"?

- A. 960
- B. 840
- C. 1230
- D. 1200

Q.6 Anand recovers the cost of 15 articles by selling 12. Determine his profit percentage.

- A. 20%
- B. 25%
- C. 12.5%
- D. 15%

- Q.7 The ratio of cash with Vandana and Deepa is 3 : 4 and that of with Kavitha and Sugitha is 9 : 8. If Deepa has Rs. 120 with her and Sugitha has Rs. 10 less than Vandana. Find the amount of cash with Kavitha.
- A. Rs. 80
  - B. Rs. 90
  - C. Rs. 100
  - D. Rs. 110
- Q.8 In a triangle XYZ; P, Q, and R are the mid points of the sides XY, YZ, and ZX respectively. What is the ratio of the area of triangles PQR and XYZ?
- A. 2:3
  - B. 4:5
  - C. 1:2
  - D. 1:4
- Q.9 If the base of a right-angled triangle is 12 times the reciprocal of its height, then determine its area.
- A. 6 sq. units
  - B. 3 sq. units
  - C. 4 sq. units
  - D. 5 sq. units
- Q.10 A tank is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the tank in the same time during which the tank is filled by the third pipe alone. The second pipe fills the tank 5 hours faster than the first pipe and 4 hours slower than the third pipe. What is the time required by the first pipe alone to fill the tank?
- A. 10 hours
  - B. 15 hours
  - C. 18 hours
  - D. 12 hours



**Physics**

- Q.1 When the speed of the moving object is doubled which of the following will necessarily happen?
- A. Its acceleration is doubled
  - B. Its momentum becomes four times more
  - C. Its K.E is increased to four times
  - D. Its potential energy is increased
- Q.2 A child throws a ball vertically upwards with a speed of 10 m/s. The maximum height reached by the ball is "h". If the child wants the ball to reach the height of "4h", then at what speed should he throw the ball?  
(Note: Use  $g = 10 \text{ m/sec}^2$ )
- A. 20 m/s
  - B. 30 m/s
  - C. 40 m/s
  - D. 25 m/s
- Q.3 Two plane mirrors are inclined at an angle  $\theta$ . When an object is placed in front of them, nine images are formed. Determine the angle between the mirrors.
- A.  $36^\circ$
  - B.  $60^\circ$
  - C.  $30^\circ$
  - D.  $45^\circ$
- Q.4 A lighthouse emits a sound of frequency of 2000 Hz. What is the frequency heard by a sailor on a boat approaching the lighthouse at the speed of 10 m/sec?  
(Note: Speed of sound in air = 340 m/sec)
- A. 2060 Hz
  - B. 1942 Hz
  - C. 2187 Hz
  - D. 2266 Hz
- Q.5 Two blocks of masses 12 kg and 4 kg are tied to the ends of a string, which passes over a fixed pulley. Compute the approximate total downward thrust on the pulley.  
(Note: Take  $g = 10 \text{ m/ sec}^2$ )
- A. 20 N
  - B. 40 N
  - C. 60 N
  - D. 120 N

- Q .6 A circular ring of mass 3 kg and radius 10 cm is rotating about its axis with constant angular velocity of 20 rad/sec. Two square blocks of mass 0.5 kg each are placed at the edges of diameter of the ring. The new angular velocity of the ring is:
- A. 20 rad/sec
  - B. 18 rad/sec
  - C. 15 rad/sec
  - D. 11 rad/sec
- Q .7 An incompressible liquid is filled in a cylindrical container of radius 50 cm. When the liquid is rotated it acquires a parabolic shape and the height of the liquid changes by 20 cm. If the density of liquid is 2.2 g/cc, then determine the angular velocity of rotation.  
(Note: Take  $g = 10 \text{ m/ sec}^2$ )
- A. 40 rad/sec
  - B. 50 rad/sec
  - C. 56 rad/sec
  - D. 48 rad/sec
- Q .8 The enthalpy of vaporization of water = 45.953 kJ/mol. At 1 atm pressure the boiling point of water is 373 k. The boiling point of water is  $178 \times$  Kelvin, when pressure is equal to 1/2 atm. Find x.  
(Given:  $\log 2 = 0.3$ )
- A. 3
  - B. 4
  - C. 2
  - D. 1
- Q .9 A compound microscope is used to enlarge an object kept at a distance of 6 cm from its objective which consists of several convex lenses in contact and has focal length of 2 cm. If a lens of focal length of 8 cm is removed from the objective, then by what distance must the eyepiece of the microscope be moved to refocus the image?
- A. 1.8 cm
  - B. 4.8 cm
  - C. 3 cm
  - D. 2.4 cm
- Q .10 Which of the following functions is performed by a zener diode?
- A. Stabilisation
  - B. Amplification
  - C. Rectification
  - D. Oscillation production

**Chemistry**

- Q.1 Which of the following is a correct set for the shape of  $\text{XeF}_4$  molecule and the hybridisation of Xenon in it?
- A. Tetrahedral and  $sp^3$
  - B. Square planar and  $dsp^2$
  - C. Square planar and  $sp^3d^2$
  - D. Octahedral and  $d^2sp^3$
- Q.2 Dalton's law of partial pressure is applicable to which one of the following systems?
- A.  $\text{NH}_3 + \text{HCl}$
  - B.  $\text{NO} + \text{O}_2$
  - C.  $\text{H}_2 + \text{Cl}_2$
  - D.  $\text{CO} + \text{H}_2$
- Q.3 P follows first order reaction ( $\text{P} \rightarrow \text{Product}$ ), the concentration of P changes from 0.1 M to 0.001 M in 50 minutes. Calculate the rate of reaction when the concentration of P is 0.01 M.
- A.  $9.21 \times 10^{-4} \text{ mol L}^{-1} \text{ min}^{-1}$
  - B.  $3.14 \times 10^{-4} \text{ mol L}^{-1} \text{ min}^{-1}$
  - C.  $12.21 \times 10^{-4} \text{ mol L}^{-1} \text{ min}^{-1}$
  - D.  $17.24 \times 10^{-4} \text{ mol L}^{-1} \text{ min}^{-1}$
- Q.4 The order of screening effect in a given shell is:
- A.  $s > p > d > f$
  - B.  $s > p > f > d$
  - C.  $f > d > p > s$
  - D.  $s < p < d < f$
- Q.5 Which of the following compounds is formed when ethyl benzene is oxidised by  $\text{KMnO}_4$ ?
- A. Benzophenone
  - B. Acetophenone
  - C. Benzoic acid
  - D. Benzyl alcohol
- Q.6 In the electrolysis of copper sulphate (cathodic reaction), for the production of one mole of copper, how many moles of electrons are needed?
- A. 1 mole
  - B. 2 moles
  - C. 3 moles
  - D. 4 moles

Q.7 Which of the following statements regarding real gases are CORRECT?

- I. Real gases obeys vander waal equation.
- II. Real gases obeys all the gas laws at all temperatures and pressures.
- III. All existing gases are real.
- IV. In real gas volume of molecules is negligible as compared to the total volume of gas.

- A. I and II
- B. I and III
- C. I and IV
- D. All I, II, III, and IV

Q.8 Which of the following statements is/are true with respect to Gas laws?

- I. At a constant pressure, the volume of given mass of any gas decreases or increases by  $1/273.15$  times of its volume at zero degree Celsius for every 1-degree Celsius fall or rise in temperature.
- II. One mole of a gas at Standard Temperature and Pressure (STP) will occupy 22.4 litres of volume.

Choose the correct answer from the options given below.

- A. Both I and II are true
- B. Only I is true
- C. Only II is true
- D. Both I and II are false

Q.9 A compound 'X' is obtained when chlorobenzene is heated with chloral in the presence of concentrated sulphuric acid. Identify 'X'.

- A. Gammaxene
- B. DDT
- C. Freon
- D. Hexachloroethane

Q.10 Identify the compounds that give positive Tollen's test.

- I. Glucose
- II. Sucrose
- III. Fructose
- IV. Hexanal
- V. Acetophenone

Choose the correct answer from the options given below.

- A. I and II
- B. I and III
- C. IV and V
- D. II and III

**Current Affairs**

- Q.1 Who are the founders of the multinational corporation, Google?
- A. Jack Dorsey and Biz Stone
  - B. Noah Glass and Evan Williams
  - C. Larry Page and Sergey Brin
  - D. Stewart Butterfield and Caterina Fake
- Q.2 India's first nuclear power plant was:
- A. Kakrapur Atomic Power Station
  - B. Tarapur Atomic Power Station
  - C. Kaiga Nuclear Power Plant
  - D. Rajasthan Atomic Power Station
- Q.3 The first satellite of India that was launched by the USSR was:
- A. INSAT-IA
  - B. SROSS-I
  - C. Prithvi
  - D. Aryabhata
- Q.4 International Women's Day is celebrated on:
- A. March 8
  - B. June 11
  - C. September 3
  - D. January 19
- Q.5 Which is the first engine-less train in India?
- A. Train 15
  - B. Train 18
  - C. Train 20
  - D. Train 1
- Q.6 With which country's President did India have an informal summit in 2019?
- A. Pakistan
  - B. China
  - C. France
  - D. USA

- Q.7 Who is the only Indian to win a gold medal in weightlifting in the Olympics?
- A. Karnam Malleshwari
  - B. Kavita Devi
  - C. Monika Devi
  - D. Vandana Gupta
- Q.8 Who was awarded the 2019 Nobel Peace Prize?
- A. Greta Thunberg
  - B. Abiy Ahmed
  - C. Zoran Zaev
  - D. Raoni Metuktire
- Q.9 Who is known as "Father of White Revolution"?
- A. V Kurien
  - B. MS Swaminathan
  - C. Baba Amte
  - D. J P Narayan
- Q.10 The prestigious Ramon Magsaysay Award was conferred upon Ms. Kiran Bedi for her excellent contribution to which of the following fields?
- A. Journalism
  - B. Social Service
  - C. Government Service
  - D. Literature