Indian Institute of Technology Madras
Zanzibar Campus

IIT Madras Zanzibar Campus Screening Test (IITMZST)

Sample Questions

Bachelor of Science

English and Comprehension

Question 1 and 2 consist of a pair of capitalized pair of words that bear some meaningful relationship to each other. Choose the pair whose relationship is most similar to that expressed by the capitalized pair.

1. ETYMOLOGY: WORD
   a. Etiology: disease
   b. History: event
   c. Literature: author
   d. Microscopy: microbe

2. CONQUER: SUBJUGATE
   a. Esteem: respect
   b. Slander: vilify
   c. Discern: observe
   d. Ponder: deliberate

For Questions 3 and 4, choose the word when substituted for the blank space, best completes the meaning of the sentence.

3. A careful . . . . of the house revealed no clues
   a. Incineration
   b. Autops
   c. Dereliction
   d. Examination

4. We need more men and women of culture and enlightenment in our society; we have too many . . . . among us.
   a. Pedants
   b. Philistine
   c. Ascetics
   d. Apologist

For Question 5 and 6, select the one word that has nearly the same meaning as the italicized word in the context of the sentence.

5. He got into a *fatuous* argument.
   a. Inane
   b. Avarice
   c. Nefarious
   d. Pretentious

6. Our *recalcitrant* boss refuses to listen to the union representatives.
   a. Indefatigable
   b. Unfocussed
   c. Impudent
   d. Obdurate

Questions 7-10 are based on the following related passages.

Passage 1

The first Industrial Revolution, which occurred in Great Britain in the latter half of the 18th century, represented a sudden acceleration of technological and economic development that would permeate all levels of British society. Specifically, the traditional agrarian economy was supplanted by one based on manufacturing and machinery. Very much an urban movement, the revolution gave rise to a new system of social class, based primarily upon the relationship of the industrial capitalist to the factory worker. These changes can be attributed to a number of favorable societal circumstances including an increasing population, which would provide both a larger work force and expanding markets, a strong middle class, and stability in both the political environment and the monetary system.

Passage 2

Though the Industrial Revolution certainly saw the transformation of many different aspects of British social and economic life, these changes were primarily effects, not to be mistaken for causes. Undoubtedly, the burgeoning population and established political system provided an apt environment for revolution. Yet the chief factors were rooted not in broad changes in society, but rather in extraordinary technological innovations within a few industries. Within the smelting industry, for example, the production of new materials, namely iron and steel, would allow for stronger, more complex machinery. Coupled with the invention of James Watt's steam engine in the 1780s, these innovations laid the groundwork for massive

technological progress that would in turn pave the way for those significant social and economic changes.

7. In passage 1, in the sentence "Very much an urban movement, the revolution gave rise to a new system of social class, based primarily upon the relationship of the industrial capitalist to the factory worker", "movement" refers to

    a. Drift

    b. Motion

    c. Emigration

    d. Development

8. The author of the passage 2 refers to James Watt's steam engine in order to

    a. Show how certain innovations were major factors in the Industrial Revolution

    b. Demonstrate the high level of talent among Britain's inventors

    c. Illustrate how social and economic change affected technology

    d. Discuss the revolutionary railroad network established in Britain

9. The passages support which generalization about the industrial Revolution in Britain?

    a. It was caused primarily by social factors

    b. It was caused primarily by technological factors

    c. It was a time of rapid transformation

    d. It brought on the demise of the traditional agrarian economy

10. Which statement best describes a significant difference between the authors' interpretation of population increase and its relationship to the Industrial Revolution?

    a. Author 1 maintains that a growing population was not a major factor in the revolution; Author 2 maintains that it was a prerequisite.

    b. Author 1 states that it was one of the major factors; Author 2 claims that it was important for setting the stage, but was not the main catalyst

    c. Author 1 contends that population growth was the greatest in the more industrialized regions; Author 2 maintains that population growth was suppressed in those areas

    d. Author 1 believes the relationship has been distorted; Author 2 believes it has been overemphasized
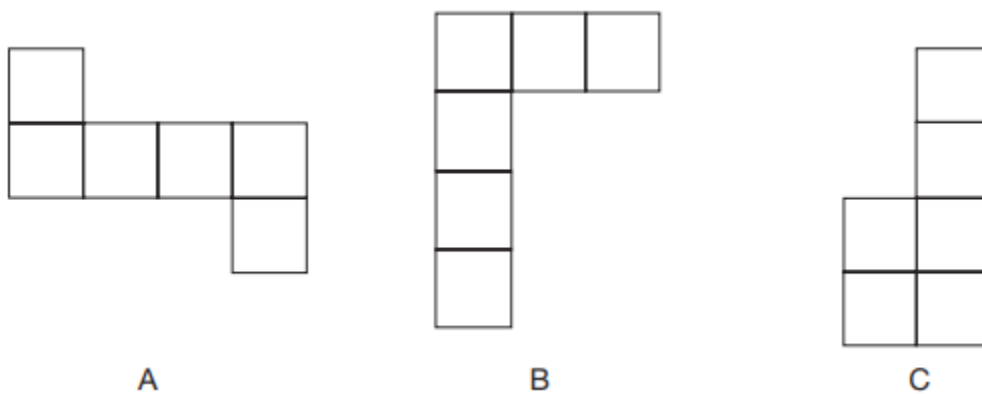
Analytical Ability

1. Identify the answer shape that share a feature in common with the question shapes:
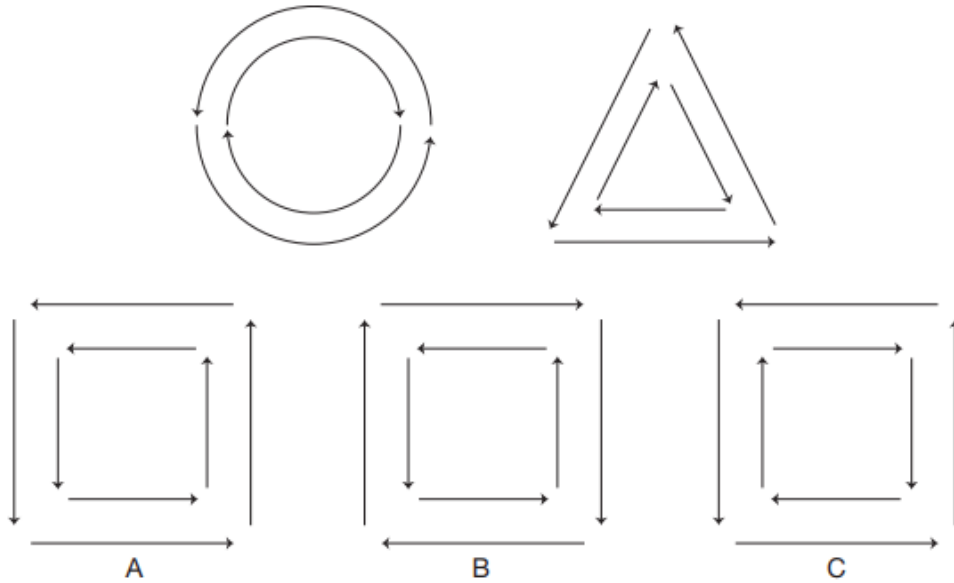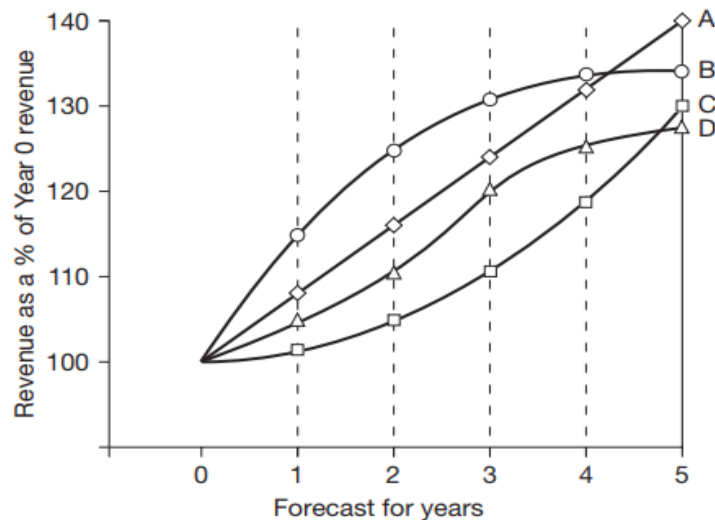

Ans: C

2. Which of the following shapes could form a cube, when cut out and folded?

Ans: A

3. An IT company plans an aggressive programme of expansion in output and has produced the table below to summarize four scenarios for growth from revenue from sales:

Yr 0 revenue = $26 million

In Year 3, what percentage of Year 0 revenue is forecast in scenario D?

   a. 110%

   b. 120%

   c. 122%

   d. 130%

4. Which scenario best fits the following figures:
   Year 1 $30m, Year 2 $32.5m, Year 3 $33.8m, Year 4 $34.5m, Year 5 $34.7m?

   a. Scenario A

   b. Scenario B

   c. Scenario C

   d. Scenario D

5. What is the next number in the sequence: 6561, 2187, 729, 243, 81, __?

Ans: 27

6. The angle (in degrees) between the hour and minute hand of a 12-hour clock at 3:15 pm is

Ans: 7.5

Chemistry

1. Silver chloride turns grey in sunlight, which is due to the decomposition of silver chloride into
   a. Silver oxide and hydrogen chloride
   b. Silver and chlorine
   c. Silver oxide and chlorine
   d. Silver and hydrogen chloride

2. Correct statement(s) about the ionic compounds is/are
   a. Ionic compounds are liquid.
   b. They have high melting and boiling point.
   c. They are not soluble in petrol.
   d. They conduct electricity in the solid state.

3. Among the following, allotropes of carbon are
   a. Ethane
   b. Diamond
   c. Fullerene
   d. Benzene

   Answer
   a. A and B
   b. B and C
   c. C and D
   d. A and D

4. The number of structural isomers possible with molecular formula C_5H_{12} is
   a. 2
   b. 3
   c. 5
   d. 6

5. Hybridization and shape of ammonia, respectively, are

    a. sp^3 and bent

    b. sp^2 and trigonal planar

    c. sp^3 and pyramidal

    d. sp^2 and T-shape

6. The correct order of metallic character of following elements is
   Be, Si, Na, Mg

    a. $Si < Be < Mg < Na$

    b. $Na < Si < Be < Mg$

    c. $Mg < Na < Si < Be$

    d. $Be < Mg < Na < Si$

7. Among the following, isobars are

    a. $^{14}_{6}C$ and $^{12}_{6}C$

    b. $^{12}_{6}C$ and $^{14}_{7}N$

    c. $^{14}_{7}N$ and $^{15}_{7}N$

    d. $^{14}_{6}C$ and $^{14}_{7}N$

Mathematics

1. For a polynomial p(x), the value of p(2) is 0.
   Which of the following must be true about the polynomial p(x) ?

    a. x-2 is a factor of p(x)

    b. x+2 is a factor of p(x)

    c. x is a factor of p(x)

    d. x^2 is a factor of p(x) is a factor of p(x)

2. For what values of n is |n-1| - 1 equal to 0.

    a. 0

    b. 1

    c. 2

    d. No such value of n exists.

3. The mean of the first n natural numbers is

    a. n

    b. n(n+1)/2

    c. (n+1)/2

    d. n/2

4. Solution of the equation $\log_x (x+2)=2$ is?

    a. x = 2, x = -1

    b. x = -1

    c. x = 2

    d. No solution

5. The slope of the line which passes through the origin and the mid point of the line segment joining the points (0,-4) and (8,0) is

    a. ½

    b. 2

    c. -2

    d. -½

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6. The n-th term of an Arithmetic Progression is 6n + 11. Find the common difference i.e. the difference between successive terms.

   Ans: 6

7. A circle is defined by the equation: 2x^2+2y^2=x. The center and radius of the circle respectively are

   a. (¼, 1/4) and ¼

   b. (¼, 0) and ¼

   c. (0, ¼) and ½

   d. (¼, ¼) and 2

8. What is the median of the set of data represented by 13, 17, 16, 14, 11, 13, 10, 16, 11, 18, 12, 17?

   Ans: 13.5

9. A die is thrown twice. The probability of getting 5 at least once is

   a. 1/12

   b. 1/6

   c. 1/36

   d. 11/36

10. Two fair dice are rolled at random. What is the probability of the sum of the digits being 10?

   a. 1/12

   b. 2/9

   c. 3/20

   d. 4/25

11. What is the value of the following expression: $\lim\limits_{n\to\infty} \frac{n+6}{2n+5}$?

   a. 1/2

   b. 2/1

   c. 3/1

   d. Does not exist

12. Let p(x) be a polynomial in x, and if p(2)= 0 and p(3)= 1, then which of the following statements are true?

    a. Both (x - 2) and (x - 3) are factors of p(x)

    b. (x - 2) is a factor of p(x) but (x - 3) is not a factor of p(x)

    c. (x - 3) is a factor of p(x) but (x - 2) is not a factor of p(x)

    d. Both (x - 2) and (x - 3) are not factors of p(x)

13. If the polynomial g(x)= x^2- 2x -3 divides the polynomial p(x) completely, then which of the following are true?

    a. $p(-3) = 0, p(-1) = 0$

    b. $p(-3) = 0, p(1) = 0$

    c. $p(3) = 0, p(-1) = 0$

    d. $p(3) = 0, p(1) = 0$

14. Two functions y=kx and y=3x^2+8x have the same derivatives at x=2. The value of k is

    a. 10

    b. 20

    c. 30

    d. 40

15. In the figure, AB is a 6 m high pole, and CD is a ladder inclined at an angle of 60° to the horizontal and reaches up to point D of the pole. If AD = 2.54 m, find the length of the ladder. (use √3=1.73)

    a. 3m

    b. 4m

    c. 5m

    d. 6m
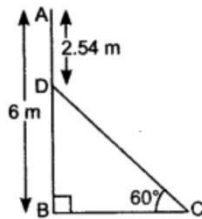
16. If a continuously differentiable function satisfies f(0)=0,f(1)=2, then for what value of k, one can be sure that there exists x in the interval [0,1] such that f^' (x)=k.

    a. 1

    b. 2

    c. 3

    d. 4

17. Let a function f(x) be such that $f'(x) = (1 + cos^2(2x))(ax^2 + bx + c)$ and $f(0) = f(1)$. Then what can we say for sure about the quadratic equation ax^2+bx+c=0?

    a. It has at least one root in [0,1]

    b. It has two roots in [0,1]

    c. It doesn't have any root in [0,1]

    d. It has three roots in [0,1]

18. If the set of points equidistant from points (1,2,3) and (3,2,-1) satisfies the equation x+ky-2z=0, then what is the value of k?

    a. -1

    b. 0

    c. 1

    d. 2

19. Assume that an ant is an insect. Which of the following is not logically equivalent to the proposition: "An ant is red or black"?

    a. If an insect is neither red nor black, it is not an ant

    b. If an insect is not red or black, it is not an ant

    c. If an insect is not an ant, it is neither red nor black

    d. If an insect is an ant, then it is red or black

20. If the ratio in which the line segment joining the points (– 3, 10) and (6, – 8) is divided by (– 1, 6) is 2:k, then the value of k is

    a. 4

    b. 5

    c. 6

    d. 7

21. If $f(x) = k^2x + 6$ for $x<1$ and $f(x) = 5kx$ for x>1, what is the value of k for which f is continuous at $x=1$?

    a. 3

    b. 4

    c. 5

    d. 6

22. If the perimeter of the circle and square are equal, then the ratio of their areas will be equal to

    a. 7:22

    b. 22:7

    c. 14:11

    d. 11:14

23. The pairs of equations $3x + y + 4 = 0$ and $18x + 6y + 26 = 0$ have

    a. Exactly one solution

    b. Two solutions

    c. Infinitely many solutions

    d. No solution

24. For the following grouped data, calculate the quantity: Mean + Median – Mode : Class | Frequency

   0-10 | 2

  10-20 | 3

  20-30 | 5

  30-40 | 2

  Ans: 27

25. Consider the following statements and select the correct options:

I. Permutations are used to calculate the number of possible arrangements of objects, while combinations are used to calculate the number of possible groups of objects.

II. The difference between permutations and combinations is that combinations consider the order of the objects, while permutations do not.

    a. Statement I is correct

    b. Both statements I and II are wrong

    c. Statement II is correct

    d. Statement II is wrong

26. Which statement regarding the vectors v and w is incorrect?

    a. The scalar multiplication of the scalar 0 and the vector v is the 0 vector

    b. The scalar multiplication of the scalar 1 and the vector v is the vector v itself

    c. $(1+2)(v+w) = v + 2w$

    d. $v.w = w.v$

27. Twelve solid spheres are made by melting a solid metallic cone of base diameter 4 cm and height 15cm. The radius of each sphere is: Ans: $(5/4)^{1/3} = 1.07$

28. Consider the following statements and choose the correct options below:

    a. Statements I and II imply statement III is a tautology
    b. The negation of statement I is "If you are not in room A, then you will not see three lights in the room"
    c. The converse of statement III is "If you see at least two lights in a room, then you are in room A or room B"
    d. The contrapositive of Statement II is "If you do not see at least two lights in a room, then you are not in room B"

29. Let $\{a_n\}$ and $\{b_n\}$ be two sequences of real numbers. Consider the following statements and choose the correct options below:

    I. If $\{a_n\}$ and $\{b_n\}$ are both convergent, then the sequence $\{a_n + b_n\}$ is also convergent
    II. The sequence $\{a_n + b_n\}$ may converge even if $\{a_n\}$ and $\{b_n\}$ are both divergent
    III. If the sequence $\{a_n \, b_n\}$ converges then at least one of $\{a_n\}$ or $\{b_n\}$ must be convergent

    a. All 3 statements are false
    b. Statement I is true
    c. Statement II is true
    d. Statement III is true

30. Find the value of $\lim\limits_{x\to 0} \dfrac{7\,coscos\,x - 1}{2e^x + 1}$ Ans: 2

31. Suppose $\int x\,ln\,ln\,(1+x) = f(x)ln(x+1) + Kx^3 + Lx^2 + Mx + C$ where K, L, M are real numbers and C is the constant of integration. Which of the following are correct?

    a. $f(x) = \dfrac{x^2 - 1}{2}$

    b. $K = 1$

    c. $L = -\tfrac{1}{4}$

    d. $M = \tfrac{1}{4}$

32. Which of the following expressions converges to $\int_3^4 x^6 dx$ as $n \to \infty$?

    a. $\sum_{k=0}^{n-1} \left(3 + \dfrac{2k+1}{2n}\right)^6 \dfrac{1}{n}$
    b. $\sum_{k=0}^{n-1} \left(\dfrac{2k+1}{2n}\right)^6 \dfrac{1}{n}$
    c. $\sum_{k=0}^{n-1} \left(3 + \dfrac{\{2k+1\}}{n}\right) \dfrac{1}{n^6}$
    d. $\sum_{k=0}^{n-1} \left(4 + \dfrac{2k+1}{2n}\right)^6 \dfrac{1}{n}$

Physics

1. If the number of radioactive atoms at a given time t is expressed as $N(t) = N_0 e^{-kt}$, where N_0 is the number of atoms at $t = 0$. What is the dimension of k?

   a. LT

   b. $\log(T)$

   c. T

   d. T^{-1}

2. *[Numerical Type]* A physical quantity, X is expressed in terms of variables a, b, c as $X = ab^2c$. Calculate the percentage error in X, when the error in measurement of a, b, c, are 4%, 2%, and 3% respectively.

   Ans: 11%

3. Which of the following quantities has the same dimensions as angular velocity?

   a. Linear velocity

   b. Frequency

   c. Acceleration

   d. Energy

4. If a thermometer has a least count of 0.1°C, what is the smallest temperature difference it can measure?

   a. 0.01°C

   b. 0.1°C

   c. 1.0°C

   d. 0.001°C

5. A car with a mass of 1200 kg accelerates from rest to a velocity of 20 m/s in 10 seconds. What is the average net force acting on the car during this time?

   a. 600 N

   b. 2400 N

   c. 12000 N

   d. 24000 N

6. A ball of mass 1 kg and velocity 8 m/s collided head-on with a ball of mass 2 kg while it is at rest. After the collision, the first ball moved in the opposite direction with a velocity of 4 m/s. What is the speed of the second ball after the collision?

    a.   5 m/s

    b.   6 m/s

    c.   8 m/s

    d.   10 m/s

7. A passenger sitting in train A moving at 90 kmph observes another train B moving in the opposite direction for 8 s. If velocity of train B is 54 kmph, length of train B is:

    a.   80 m

    b.   320 m

    c.   200 m

    d.   120 m

8. A ball is thrown vertically up with an initial velocity of 150 m/s. The ratio of velocity after 3s and 5s is $(x+1)/x$. The value of x is:

    a.   10

    b.   -5

    c.   5

    d.   6

9. A wire of length 'L' and radius 'r' is clamped rigidly at one end. When the other end of the wire is pulled by a force f, its length increases by 'l'. Another wire of the same material of length '2L' and radius '2R' is pulled by a force '2f'. Then the increase in its length will be

    a.   2l

    b.   4l

    c.   l

    d.   l/2

10. Average kinetic energy of a molecule of a gas is:

    a.   proportional to volume

    b.   dependent on the nature of the gas

    c.   proportional to absolute temperature

    d.   proportional to pressure

11. Under isothermal condition, pressure of a gas is given by $P = a V^{-3}$ where a is constant and V is the volume of the gas. The bulk modulus at constant temperature is equal to:

    a. P/2

    b. P

    c. 3P

    d. 2P

12. A body cools from 80°C to 60°C in 5 minutes. The temperature of the surrounding area is 20°C. The time it takes to cool from 60°C to 40°C is:

    a. 500 s

    b. 450 s

    c. 25/3 s

    d. 420 s

13. A ball after having fallen from rest under the influence of gravity for 6s crashes through a horizontal glass plate, thereby losing two-thirds of its velocity. If it then reaches the ground in 1s, find the height of the plate from the ground

    a. 40.8 m

    b. 24.5 m

    c. 14.3 m

    d. 22.8 m

14. Consider a copper block of mass 2 kg hanging vertically from a spring of force constant k = 300 N/m. The block is pulled down 15 cm below equilibrium and released. What is the kinetic energy when the block is 5 cm above the equilibrium?

    a. 3.0 J

    b. 2.0 J

    c. 2.5 J

    d. 3.5 J

15. Kepler's second law states that the radius vector to a planet from the sun sweeps out equal area in equal intervals of time. The law is a consequence of conservation of

    a. Time
    b. Mass
    c. Linear Momentum
    d. Angular Momentum

16. A light beam passes from air into a liquid and is deviated by 14° towards the surface normal, when the angle of incidence is 50°. What is the index of refraction of the liquid?

    a. 1.73
    b. 1.50
    c. 1.60
    d. 1.30

Note: This text only represents the type of questions that will be asked during the screening test. It is not indicative of the exam pattern or number of questions that will be asked during the screening test.

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For queries related to sample questions

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