



CLASS - 10



**SCHOLARSHIP FOR HIGH ACHIEVERS
AND NEEDY STUDENTS**

SAMPLE QUESTION PAPER

TIME : 2 HOURS

SCIENCE APTITUDE TEST

MAX MARKS : 300

Important Instructions

- This Question paper contains 4 Parts**
Part - I : Mental Ability - 15 Questions | Part - II : Mathematics - 30 Questions | Part - III : Physics & Chemistry - 20 Questions | Part - IV : Biology - 10 Questions
- Marking Scheme: For each correct answer 4 marks will be awarded and for each wrong answer -1 mark will be deducted. In case of no response zero mark will be awarded**
- There is only one correct answer for each Question.**
- Darken the appropriate circle completely for the correct answer.**
- Use blue/black ballpoint pen only.**
- Fill in all the personal details given in the OMR sheet in the space provided.**
- Rough work is to be done in the space provided for this purpose in the Test Booklet only**



IIT Ashram
IIT-JEE | NEET | OLYMPIADS | FOUNDATION (6 to 10)

Head Office: UG - 1 & 2, Concorde Complex, Above PNB, R.C. Dutt Road., Alkapuri Vadodara.
Ph. 903 3063 029 | 9081 062 221

MANJALPUR - IIT ASHRAM : SF - 1 TO 12, Kabir Plaza, Beside Kabir Complex, Above IDBI Bank, Infront of Army Camp
Manjalpur, Nr. Gupta Hospital, Bhavan's Makarpura Road, Manjalpur . **M : 9033063024 / 9033063027**

ANAND : IIT ASHRAM : 2nd Floor, HR Stone Building, Beside Croma Showroom, A.V. Road, Nr. Town Hall, Anand.
M: 9227777098, 8460009041.

Bhayli : IIT ASHRAM : Akshar Pavilion, 3 rd Floor, Tower A, Nilamber Circle, Main rd, Bhayli, Vadodara, Gujarat .
M : 6358891896, 9081062221

PART - I : MENTAL ABILITY**DIRECTION (Question 1 to 3)**

125 small but identical cubes are put together to form a large cube. This larger cube is now painted on all six faces.

- How many of the smaller cubes have no face painted at all?
(a) 27 (b) 64
(c) 8 (d) 36
- How many of the smaller cubes have exactly one face painted?
(a) 49 (b) 54
(c) 64 (d) 72
- How many of the smaller cubes have exactly two faces painted?
(a) 25 (b) 16
(c) 36 (d) 64
- In a certain code language, if the word 'REJECTION' is coded as SGMIHZPWW, then how is the word 'MECHANIC' coded in that language?
(a) NGFLFTP K (b) NGPLFTP K
(c) NGFKFTP K (d) NGPTPKIL
- On which day of the week does 5th June, 2001 fall?
(a) Monday (b) Tuesday
(c) Wednesday (d) Thursday

- From his house, Kabir went 15 km to the North. Then he turned West and covered 10 km. Then, he turned South and covered 5 km. Finally turning to East, he covered 10 km. In which direction is he from his house?
(a) East (b) West
(c) North (d) South
- Step 1 :** Add 9
Step 2 : Subtract 2
Step 3 : If less than 12, jump to step 1 and continue from there; otherwise proceed to step 4
Step 4 : Add 5
Step 5 : If greater than 16, subtract 3
If you start with a value of 8 and then apply the above instructions, what is the end result?
(a) 11 (b) 17
(c) 18 (d) 19
- Find the odd one out
(a) Regiment (b) Lieutenant
(c) Colonel (d) Major
- Find the missing term?
7, 8, 18, 57, ?, 1165, 6996
(a) 542 (b) 228
(c) 232 (d) 415
- P, Q, R, S and T sit around a table. P sits two seats to the left of R and Q sits two seats to the right of R. If S sits in between Q and R, who sits to the immediate right of P?
(a) T (b) S
(c) Q (d) R

Space for Rough Work

11. In a certain code language, if the number 1 is assigned to all the letters in odd numbered places in the alphabet and the remaining letters are assigned the number 2, then what is the code for the word 'INDIAN'?

(a) 121212 (b) 111222
(c) 112212 (d) 122112

DIRECTION: (Q.12 TO 13)

Out of a group of 245 pilgrims, 105 visited Badrinath, 95 visited Kedarnath and 95 visited Somnath. Fifteen of them visited all three shrines, while 190 visited exactly one of the three shrines. The number of pilgrims who visited exactly two out of the three shrines is three times as many as those who have not visited any one of the three shrines.

12. How many pilgrims have not visited any one of the three shrines?
- (a) 20 (b) 10
(c) 15 (d) 25
13. How many pilgrims visited not more than one shrine?
- (a) 50 (b) 100
(c) 150 (d) 200
14. Choose the one which is different from the others. **W, H, P, D**
- (a) P (b) W
(c) D (d) H
15. How many times, the minute hand of a clock overlaps with the hour hand from in a day?
- (a) 24 (b) 12
(c) 23 (d) 22

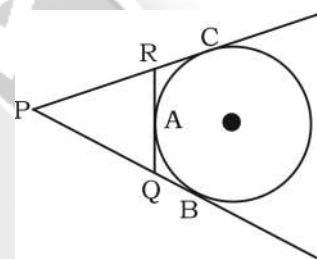
PART - II : MATHEMATICS

1. Find the relation obtained by eliminating ' θ ' from the equations $x = a \sec \theta$ and $y = b \tan \theta$

(a) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (b) $a^2x^2 + b^2y^2 = 1$

(c) $a^2x^2 - b^2y^2 = 1$ (d) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

2. In the given figure PB, PC, and QR are tangents to the circle at B, C, and A, respectively. If PB = 12 cm, then find the perimeter of the triangle PQR.



- (a) 16 cm (b) 30 cm
(c) 24 cm (d) 36 cm
3. The graph of quadratic polynomial intersects the x-axis at two points iff:
- (a) $D = 0$ (b) $D > 0$
(c) $D < 0$ (d) None
4. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are α, β , find the quadratic equation whose roots are α^2, β^2 .
- (a) $a^2x^2 - b^2x + c^2 = 0$
(b) $x^2 + (b^2 - 2ac)x / a^2 + (c^2/a^2) = 0$
(c) $ax^2 + bx + c = 0$
(d) $x^2 - bx + c = 0$

Space for Rough Work

5. The sum of squares of zeros of the polynomial $x^2 - 6x + k$ is 20. Find k .
 (a) 12 (b) 13
 (c) 6 (d) 8
6. The age of father is 5 years more than 3 times the age of son. After 5 years, father's age will be twice of son's age. Find present ages.
 (a) 20,5 (b) 35,10
 (c) 40,15 (d) Not Possible
7. In ΔPQR , A and B are two points on PQ and PR, respectively, such that $AB \parallel QR$. If $PA = 2x + 3$, $AQ = 6x - 16$ and $PB : BR = 3:4$, then what will be the value of x ?
 (a) 10 (b) 9
 (c) 14 (d) 6
8. A toy is in the form of a cone surmounted on hemisphere. Cone height = 11 cm, hemisphere diameter = 7 cm. Volume of toy?
 (a) 231 cm^3 (b) 331 cm^3
 (c) 131 cm^3 (d) None
9. A number is 3 more than twice another. If their sum is 27, find the numbers.
 (a) 8,19 (b) 9,18
 (c) 7,20 (d) 10,17
10. Solve: $101x + 99y = 402$, $99x + 101y = 398$. Value of x, y ?
 (a) (2,3) (b) (5,1)
 (c) (3,1) (d) (4,1)
11. A train travels 120 km at uniform speed. If speed was 10 km/h more, time reduces by 36 min. Find speed.
 (a) 40 km/h (b) 30 km/h
 (c) 50 km/h (d) 60 km/h
12. In ΔABC , if AD is median, then area $(\Delta ABD) = ?$
 (a) $1/2 \text{ area}(\Delta ABC)$
 (b) $1/3 \text{ area}(\Delta ABC)$
 (c) $1/4 \text{ area}(\Delta ABC)$
 (d) $2/3 \text{ area}(\Delta ABC)$
13. A solid sphere of radius 7 cm is melted to form small spheres of radius 1 cm. Number of spheres = ?
 (a) 343 (b) 400
 (c) 350 (d) 240
14. If $\Delta ABC \sim \Delta DEF$ and $AB/DE = 1/2$, then $\text{area}(ABC) / \text{area}(DEF) = ?$
 (a) $1/4$ (b) $1/2$
 (c) 2 (d) $1/3$
15. Height of building = 20 m. Shadow length at 30° elevation = ?
 (a) $10\sqrt{3}$ (b) $20\sqrt{3}$
 (c) $30\sqrt{3}$ (d) $40\sqrt{3}$

Space for Rough Work

16. If one of the roots of a quadratic equation having rational coefficients is $3+\sqrt{2}$, then the quadratic equation is
- (a) $x^2 - 3\sqrt{2}x + 6 = 0$
 (b) $x^2 - 6x + 7 = 0$
 (c) $x^2 + 3\sqrt{2}x + 6 = 0$
 (d) $x^2 + 6x + 7 = 0$
17. $\sin^2(2x - 10)^\circ + \cos^2(x + 30)^\circ = 1$, then $x = ?$
- (a) True for all value of x
 (b) 30°
 (c) 40°
 (d) 60°
18. $2\tan 30^\circ + 3\cos 60^\circ = ?$
- (a) $\sqrt{3}+1.5$ (b) $\frac{2}{\sqrt{3}}+1.5$
 (c) $1+\sqrt{3}$ (d) None
19. If $\sin\theta + \cos\theta=1$, find $\sin^3\theta + \cos^3\theta$?
- (a) 0 (b) $1/2$
 (c) 1 (d) $\frac{\sqrt{2}}{2}$
20. A card is drawn from 52 cards. Probability of king or queen?
- (a) $1/13$ (b) $2/13$
 (c) $1/26$ (d) $1/52$
21. Remainder when $2^{103} \div 7$?
- (a) 1 (b) 2
 (c) 3 (d) 4
22. Find smallest number which when divided by 12,16,20 leaves remainder 3 in each case.
- (a) 243 (b) 323
 (c) 403 (d) 483
23. The sum of first n terms of AP is $S_n=3n^2+5n$. Find the 20th term.
- (a) 125 (b) 123
 (c) 127 (d) 122
24. Find the distance between the point of intersection of lines $2x + 3y - 5 = 0$ and $x - y + 1 = 0$, and the origin.
- (a) $53/5$ (b) $53/25$
 (c) $\sqrt{53}/5$ (d) $\sqrt{3}/5$
25. Find the value of k for which the lines $2x + 3y = 7$ and $kx - y = 2$ are parallel.
- (a) $-2/3$ (b) $2/3$
 (c) $-3/2$ (d) $3/2$
26. Find the GCD of the numbers p and q where $p = 2^3 \times 3^2 \times 7^2 \times 11^6$ and $q = 2^2 \times 3^1 \times 5^4 \times 11^2 \times 13^2$.
- (a) 776 (b) 1452
 (c) 1164 (d) 2028
27. Find the area of the triangle formed by the line $5x + 4y - 20 = 0$ with the coordinate axes (in square units).
- (a) 10 (b) 12
 (c) 15 (d) 20

Space for Rough Work

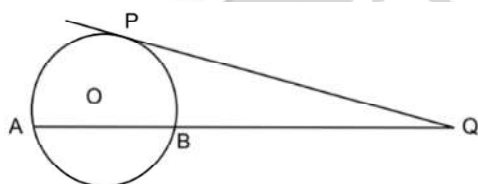
28. If $(-7, 8)$, $(-3, 9)$ and $(-5, 6)$ are the vertices of a parallelogram taken in that order. Find the coordinates of the fourth vertex.

- (a) $(-9, 5)$ (b) $(-8, 4)$
(c) $(-8, 5)$ (d) $(-9, 4)$

29. The sum of LCM and HCF of two numbers is 1260. If their LCM is 900 more than their HCF find the product of two numbers.

- (a) 203400 (b) 194400
(c) 198400 (d) 205400

30. In the given figure, O is the centre of the circle. If tangent $PQ = 12$ cm and $AB = 10$ cm, then QB is equal to ____.



- (a) 8 cm (b) 9 cm
(c) 10 cm (d) 6 cm

PART - III : PHYSICS & CHEMISTRY

1. An α -particle starts from rest and accelerates uniformly with 0.01 m s^{-2} towards a positive plate in a straight path in an electric field for 10 s. What will be the average speed of the α -particle?

- (a) 0.5 cm s^{-1} (b) 0.05 cm s^{-1}
(c) 0.5 m s^{-1} (d) 0.05 m s^{-1}

2. A total of 10^{19} electrons flow through a conductor of resistance 20Ω in one second. Find the potential difference between the terminals of the conductor.

- (a) 32 V (b) 64 V
(c) 16 V (d) 20 V

3. A light ray is incident on a surface with a glancing angle of reflection of 30° . Find the angle of deviation.

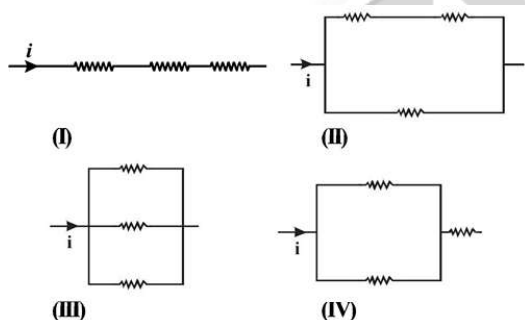
- (a) 30° (b) 45°
(c) 120° (d) 60°

4. The power of an eye lens used by a person is +2D. Which of the following defects is the person suffering from?

- (a) presbyopia (b) myopia
(c) hypermetropia (d) astigmatism

Space for Rough Work

5. Which of the following will the focal length of a convex lens be maximum for?
 (a) red light (b) yellow light
 (c) green light (d) blue light
6. Which of the following has no unit?
 (a) Amplitude (b) Pitch
 (c) Frequency (d) Time period
7. The three resistance of equal value are arranged in the different combinations shown below. Arrange them in increasing order of power dissipation.



- (a) III < II < IV < I (b) II < III < IV < I
 (c) I < IV < III < II (d) I < III < II < IV

8. Refractive index of glass with respect to air is $\frac{3}{2}$, then refractive index of air with respect to glass will be
 (a) $\frac{1}{3}$ (b) $\frac{1}{2}$
 (c) $\frac{2}{3}$ (d) $\frac{3}{4}$
9. Twinkling of stars is due to atmospheric
 (a) dispersion of light by water droplets
 (b) refraction of light by different layers of varying refractive indices
 (c) scattering of light by dust particles
 (d) internal reflection of light by clouds
10. If a wire of resistance R is melted and recast into a wire of $\frac{2}{5}$ th its length, the new resistance of the wire will be

- (a) R (b) $\sqrt{\frac{2}{5}}R$
 (c) $\frac{2}{5}R$ (d) $\left(\frac{2}{5}\right)^2 R$

Space for Rough Work

11. Isotopes have –
(a) Same protons and electrons number
(b) Same protons, electrons and neutrons number
(c) Same neutrons number but different in protons and electrons number
(d) None of these
12. Solvay-ammonia method is used for manufacturing of –
(a) NaOH (b) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
(c) Na_2CO_3 (d) CaOCl_2
13. What amount of water is formed, when 4 g hydrogen react with 16 g oxygen?
(a) 18 g (b) 20 g
(c) 36 g (d) 8 g
14. A substance A reacts with another substance B to produce C and gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substance A and B are:
(a) HCl and NaOH (b) HCl and Na_2CO_3
(c) Na and HCl (d) Na_2CO_3 and H_2O
15. Which of the following have maximum number of molecules?
(a) 44 g of CO_2 (b) 4 g of H_2
(c) 16 g of O_2 (d) 180 g of Glucose
16. Identify the element from among the following:
(a) Fog (b) Methane
(c) Tin (d) Soil
17. Mass of one atom of oxygen is –
(a) $\frac{16}{6.022 \times 10^{23}} \text{ g}$ (b) $\frac{32}{6.022 \times 10^{23}} \text{ g}$
(c) $\frac{1}{6.02 \times 10^{23}} \text{ g}$ (d) 8 u
18. An aqueous solution whose H^+ ion concentration is 0.0002 M, what is the pOH value of this solution?
(a) 3.69 (b) 10.30
(c) 4.00 (d) 5.00
19. Which of the following does not react with dilute acid to produce hydrogen gas?
(a) Zn (b) Fe
(c) Mg (d) Cu
20. In the decomposition of lead (II) nitrate to give lead (II) oxide, nitrogen dioxide and oxygen gas, the coefficient of nitrogen dioxide (in the balanced equation) is –
(a) 1 (b) 2
(c) 3 (d) 4

Space for Rough Work

PART - IV : BIOLOGY

1. Match the tissue in Column I with its primary function in Column II.

Column I (Tissue) Column II (Function)

- | | |
|------------------|---|
| 1. Sclerenchyma. | (A) Storage of food and water |
| 2. Phloem | (B) Provides buoyancy in aquatic plants |
| 3. Parenchyma | (C) Provides mechanical strength and rigidity |
| 4. Aerenchyma. | (D) Translocation of food |

Which of the following shows the correct match?

- (a) 1 - C, 2 - D, 3 - A, 4 - B
 (b) 1 - B, 2 - D, 3 - A, 4 - C
 (c) 1 - A, 2 - B, 3 - C, 4 - D
 (d) 1 - C, 2 - A, 3 - D, 4 - B
2. Match the cell organelle in Column I with its function in Column II.

Column I (Organelle) Column II (Function)

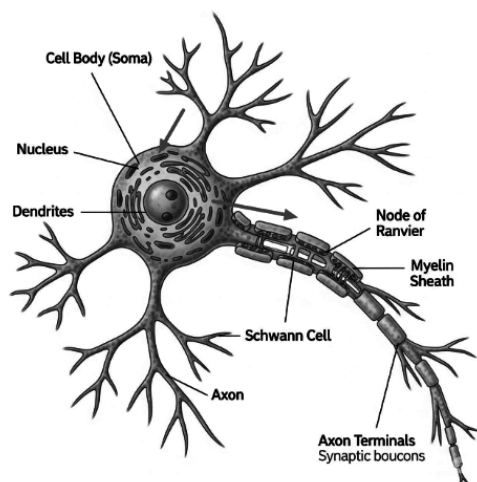
- | | |
|--------------------|--|
| 1. Ribosomes. | (A) Intracellular digestion of waste |
| 2. Lysosomes. | (B) Synthesis of proteins |
| 3. Mitochondria. | (C) Packaging and dispatching of materials |
| 4. Golgi Apparatus | (D) Cellular respiration and energy production |

Which of the following shows the correct match?

- (a) 1 - A, 2 - B, 3 - C, 4 - D
 (b) 1 - B, 2 - A, 3 - D, 4 - C
 (c) 1 - C, 2 - D, 3 - A, 4 - B
 (d) 1 - D, 2 - C, 3 - B, 4 - A

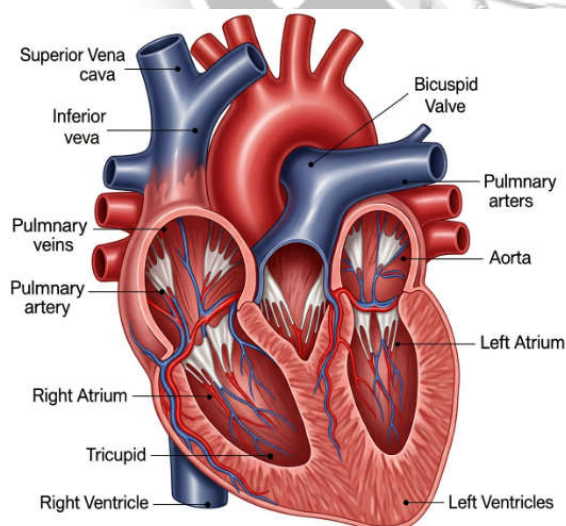
3. Which two of the following are consequences of the presence of villi in the small intestine?
- (A) Increased rate of food digestion.
 (B) Increased surface area for nutrient absorption.
 (C) Increased peristaltic movement.
 (D) Slower flow of food to allow for thorough absorption
- (a) Both A and B (b) Both B and D
 (c) Both B and C (d) Both A and D
4. Which two of the following are examples of a reflex arc?
- (A) Pulling your hand away from a hot object.
 (B) Thinking about the answer to a math problem.
 (C) The knee-jerk reflex when a doctor taps your knee.
 (D) Writing a letter to a friend.
- (a) Both A and C (b) Both A and B
 (c) Both A and D (d) Both B and C
5. **Assertion (A)** : Sex determination in humans is based on the father's sex chromosomes.
Reason (R) : Females are homozygous for sex chromosomes (XX), while males are heterozygous (XY).
- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true, but R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false but R is true.
6. **Assertion (A)**: The presence of a cell wall allows a plant cell to withstand very hypotonic external media without bursting.
Reason (R): It exerts a counter pressure on the swelling protoplast, preventing it from rupturing.
- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true, but R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false but R is true.

7. (Refer to a diagram of a nerve cell, or neuron, with its parts labeled)



In the diagram of a neuron, the arrow points from the dendrite to the axon. This indicates the direction of:

- The transmission of a chemical signal across the synapse.
 - The flow of electrical impulses.
 - The synthesis of neurotransmitters.
 - The movement of ions out of the cell body.
8. (Refer to a diagram of a human heart with its four chambers and major blood vessels labeled)



A student is tracking the path of deoxygenated blood. Which of the following is the correct path taken by this blood?

- Left atrium → Left ventricle → Aorta → Body
 - Vena Cava → Right atrium → Right ventricle → Pulmonary artery → Lungs
 - Pulmonary vein → Left atrium → Left ventricle → Aorta
 - Lungs → Pulmonary artery → Right atrium → Right ventricle
9. Which of the following statements about the nervous system is/are INCORRECT?
- The central nervous system consists of the brain and spinal cord.
 - The cerebellum is responsible for fine-tuning voluntary muscle movements.
 - The synapse is the point of contact between two neurons.
 - Reflex actions are conscious, voluntary responses.
- IV only
 - I and III
 - I and II
 - III and IV
10. Which of the following statements about human reproduction is/are CORRECT?
- The human male is the heterogametic sex.
 - Fertilization occurs in the uterus.
 - The placenta is formed from tissues of both the mother and the embryo.
 - The menstrual cycle is controlled by a single hormone.
- I and III only
 - II and IV only
 - I, II, and IV
 - I, III, and IV

Space for Rough Work