IIT ASHRAM BRINGS...

CLASS 10 PHASE-II

KH🔍J (2021)

A Hunt for young Scientists..!

SAMPLE PAPER

Time : 1 Hours   **Maximum Marks : 280**

IMPORTANT INSTRUCTIONS

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

A. GENERAL :

1. This booklet consists of 70 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. The answer sheet, a machine–readable Optical Mark Recognition (OMR), is provided separately.
4. Do not tamper with / mutilate the OMR or the Booklet.
5. Write Name and Address in capital letters on OMR sheet.
6. Submit the OMR Sheet back to Invigilator after examination before leaving the examination hall.
7. Previous year or Term exam's percentage | grade | Marks scored in Maths and Science must be written at the back of OMR Sheet

B. QUESTION PAPER FORMAT:

7. The question paper consists of **4 Parts.**

   Part-I :- Mental Ability (14 Questions)   **Part-II :- Mathematics (14 Questions)**

   Part-III :- Physics/ Chemistry (28 Questions)   **Part-IV:- Biology (14 Questions)**

C. Marking Scheme :

8. For each question in **Part-I , II, III & IV** you will be **awarded 4 marks** if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases where the answer marked is not correct, **minus one (–1) mark** will be awarded.

IIT ASHRAM

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PART – I : MENTAL ABILITY

Directions- Q1-Q2. Find the wrong term (s):

1. D4V, G10T, J20R, M43P, P90N

    (a) G10T   (b) M43P   (c) P90N   (d) D4V,

2. ABC, DGJ, HMR, NTA, SBK, ZKV

    (a) SBK,   (b) ABC   (c) NTA   (d) HMR

3. Five persons – P, Q, R, S and T, are standing in a queue. There are two persons between S and T. Q is standing in front of T. R is at the end of the queue. P is standing immediately behind S. Who is standing at the middle of the queue?

    (A) P   (B) Q   (C) S   (D) T

4. Pointing towards a man in the photograph, Archana said, "He is the son of the only son of my grandmothers. How is man related to Archana ?

    (A) Cousin   (B) Nephew   (C) Brother   (D) Son

Directions: (5 to 7)

Read the following information carefully and answer the questions given below.

(i) P, Q, R, S, T and U are six members of a family, each of them engaged in a different profession

Doctor, Lawyer, Teacher, Engineer, Nurse, Manager

(ii) Each of them remains at home at on a different day of the week from Monday to Saturday.

(iii) The Lawyer in the family remains at home on Thursday.

(iv) R remains at home on Tuesday.

(v) P, the Doctor does not remain at home either on Saturday or on Wednesday

(vi) S is neither the Doctor nor the teacher and remains at home on Friday

(vii) Q is the Engineer and T is the Manager

5. Which of the following combinations is correct?

    (A) Lawyer - Tuesday   (B) Teacher - Wednesday

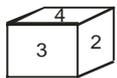   (C) Manager - Friday   (D) Nurse – Friday

6. Who is the nurse?

    (A) S   (B) R   (C) U   (D) Data inadequate

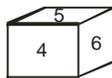7.   Who remains at home on Saturday?

   (A) S   (B)   T   (C) R   (D)   Data inadequate

8.   **Which** Calendar year for 1995 will serve same calendar for 2006 from the following years?

   (A) 2009   (B)   2005   (C) 2008   (D)   2006

   Directions (9 to 10) In each of the following questions, there is a certain relation between two given number on one side of: : and one number is given on another side of: : while another number is to be found from the given alternatives, having the same relation with this number as the numbers of the given pair bear Choose the best alternative.

9   7584:4251:: 4673:?

   (A) 1367   (B)   1340   (C) 1531   (D)   None of these

10   225 : 257 : : 289 : ?

   (A) 301   (B)   316   (C) 320   (D)   325

11.   A person starts from his house and travels 8 m towards west; then he travels 6 m towards his left, then 8 m towards west and then 4 m towards south. Finally, he turns right and travels 5 m. What is the horizontal distance traveled by him?

   (A) 30   (B)   16   (c) 21   (D)   25

12   Given that: > denotes +, < denotes - , + denotes ÷ - denotes =, = denotes 'less than' and × denotes 'greater than', find which of the following is a correct statement.

   (A) 3 + 2 > 4 = 9 + 3 < 1   (B)   3 > 2 > 4 = 18 + 3 < 2

   (C) 3 > 2 < 4 × 8 + 4 < 2   (D) 3 + 2 < 4 × 9 + 3 < 3

13.   The figures given below show the two different positions of a dice. Which number will appear opposite to number 2.
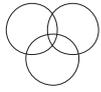

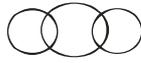   (i)   (ii)

   (A) 3   (B)   4   (C) 5   (D) 6

14. Which of the following diagrams correctly represents the relationship among Tennis fans, Cricket players and Students.
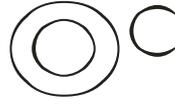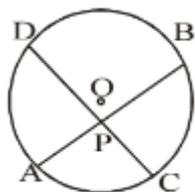
    (A)   (B)   (C)   (D)

PART – II : MATHEMATICS

1. A rectangular sheet of paper 44 cm $\times$ 18 cm is rolled along its length and a cylinder is formed. The volume the cylinder so formed is equal to ($Take \, \pi = \dfrac{22}{7}$)

   (a) 2772 cm^3 (b) 2505 cm^3 (c) 2460 cm^3 (d) 2672 cm^3

2. Let a_1 , a_2….. and b_1 , b_2 ………. be the arithmetic progressions such that $a_1 = 25$ and $b_1 = 75$ and $a_{100} + b_{100} = 100$. Find the sum of the first one hundred terms of the progression. $(a_1 + b_1)$, $(a_2 + b_2)$,___. Is

   (a) 0   (b) 100   (c) 10,000   (d) 505,000

3. **The least number which when divided by 2, 3, 4, 5 and 6 leaves the remainder 1 in each case. If the same number is divided by 7 it leaves no remainder. The number is**
   (a) 231   **(b) 301**   **(c) 371**   **(d) 441**

4. **The cross-section of a canal is a trapezium in shape. If the canal is 8m wide at the top and 6 m wide at the bottom and the area of cross-section is 644 sq m, then the length of the canal is**

   (a) 90 m   (b) 92 m   (c) 94 m   (d) 96 m

5. Which of the following is true –

   (A) Mode = 2median + Mean   (B) Median = Mode + $\dfrac{3}{2}$ [Mean – Median]

   (C) Mean = Mode + $\dfrac{3}{2}$ [Median – Mode]   (D) Median = Mode + $\dfrac{3}{2}$ [Mean +Median]

6. **In the given figure, AP = 2 cm, BP = 6 cm and CP = 3 cm. Find DP :**
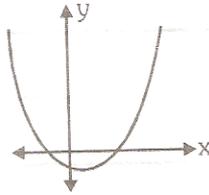

a) **6 cm**   b) **4 cm**   c) **2 cm**   d) **3 cm**

7. Two circles touch each other internally. Their radii are 2 cm and 3 cm. The biggest chord of the other circle which is outside the inner circle, is of length :

(A) $2\sqrt{2}\,cm$ (B $3\sqrt{2}\,cm$ (C) $2\sqrt{3}\,cm$ (D) $4\sqrt{2}\,cm$

8. If tanA + cotA = 4, then $\tan^4 A + \cot^4 A$ is equal to :

(A) 110   (B) 191   (C) 80   (D) 194

9. A railway half ticket costs half the full fare and the reservation charge is the same o half ticket as on full ticket. One reserved first class ticket from Mumbai to Ahmedabad costs Rs 216 and one full and one half reserved first class tickets cost Rs. 327. What is the basic first class full fare and what is the reservation charge ?

(a) Rs5   (b) Rs 6   (c) Rs 7   (d) Rs 8

10. In the figure AD is the external bisector of $\angle$ EAC, intersects BC produced to D. If AB = 12 cm, AC = 8 cm and BC = 4 cm, find CD.

(A) 10 cm   (B) 6 cm   (C) 8 cm   (D) 9 cm

11. In a single throw of two dice , getting a multiple of two on one die and a multiple of three on the other is

(A) $\dfrac{15}{36}$ (B) $\dfrac{25}{36}$ (C) $\dfrac{11}{36}$ (D) $\dfrac{5}{6}$

12. If $\sin x + \sin^2 x = 1$, then $\cos^8 x + 2\cos^6 x + \cos^4 x$ is equal to :

(A) 0   (B)– 1   (C) 2   (D) 1

13. The three sides of a triangles are given. Which one of the following is not a right triangle ?

(A) 20, 21, 29   (B) 16, 63, 65

(C) 56, 90, 106   (D) 36, 35, 74

14. Graph of y = ax² + bx + c is given adjacently. What conclusions can be drawn from the graph :

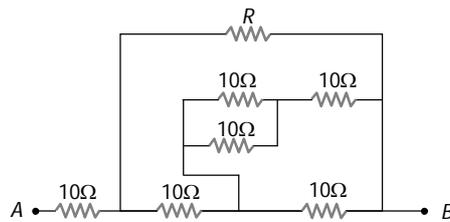(i)   a > 0   (ii) b < 0   (iii) c < 0   (iv)   b² – 4ac > 0

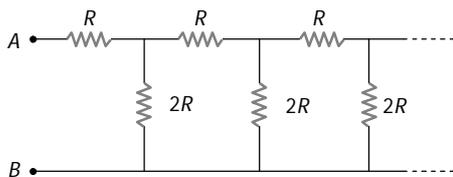(A) (i) and (iv)   (B) (ii) and (iii)   (C) (i), (ii) & (iv)   (D) (i), (ii), (iii) & (iv)

PART – III : PHYSICS/ CHEMISTRY

1. A charge q_1 exerts some force on a second charge q_2. If third charge q_3 is brought near, the force of q_1 exerted on q_2

   (a) Decreases

   (b) Increases

   (c) Remains unchanged

   (d) Increases if q_3 is of the same sign as q_1 and decreases if q_3 is of opposite sign

2. The resistance of a wire is R. If the length of the wire is doubled by stretching, then the new resistance will be

   (a) $2R$ (b) $4R$ (c) R (d) $\dfrac{R}{4}$

3. For what value of R the net resistance of the circuit will be 18 *ohm*s

   (a) $8\,\Omega$

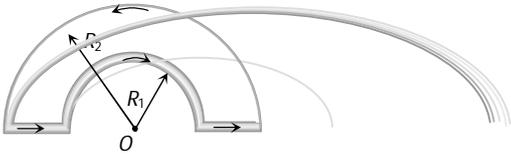   (b) $10\,\Omega$

   (c) $16\,\Omega$

   (d) $24\,\Omega$

4. An infinite ladder network is arranged with resistances R and $2R$ as shown. The effective resistance between terminals A and B is

   (a) ∞ (b) R (c) $2R$ (d) $3R$

5. If two bulbs of wattage 25 and 30, each rated at 220 *volts,* are connected in series with a 440 *volt* supply, which bulb will fuse

 (a) 25 *W* bulb   (b) 30 *W* bulb   (c) Neither of them   (d) Both of them

6. A man runs towards mirror at a speed of $15\,m/s$. What is the speed of his image

 (a) 7.5 *m/s*   (b) 15 *m/s*   (c) 30 *m/s*   (d) 45 *m/s*

7. In a concave mirror experiment, an object is placed at a distance x_1 from the focus and the image is formed at a distance x_2 from the focus. The focal length of the mirror would be

 (a) $x_1 x_2$ (b) $\sqrt{x_1 x_2}$ (c) $\dfrac{x_1 + x_2}{2}$ (d) $\sqrt{\dfrac{x_1}{x_2}}$

8. The wavelength of light in two liquids '*x*' and '*y*' is 3500 Å and 7000 Å, then the critical angle of *x* relative to y will be

 (a) 60°   (b) 45°   (c) 30°   (d) 15°

9. The magnetic induction at the centre *O* in the figure shown is

 (a) $\dfrac{\mu_0 i}{4}\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

 (b) $\dfrac{\mu_0 i}{4}\left(\dfrac{1}{R_1} + \dfrac{1}{R_2}\right)$

 (c) $\dfrac{\mu_0 i}{4}(R_1 - R_2)$

 (d) $\dfrac{\mu_0 i}{4}(R_1 + R_2)$

10. Two parallel conductors *A* and *B* of equal lengths carry currents I and 10 I, respectively, in the same direction. Then
 (a) *A* and *B* will repel each other with same force
 (b) *A* and *B* will attract each other with same force
 (c) A will attract *B*, but *B* will repel *A*
 (d) *A* and *B* will attract each other with different forces

11. The working of dynamo is based on principle of
 (a) Electromagnetic induction
 (b) Conversion of energy into electricity
 (c) Magnetic effects of current
 (d) Heating effects of current

12. A convex mirror of focal length f (in air) is immersed in a liquid $\left(\mu = \frac{4}{3}\right)$. The focal length of the mirror in liquid will be:

(A) $\left(\frac{3}{4}\right)f$ (B) $\left(\frac{4}{3}\right)f$ (C) f (D) $\left(\frac{7}{3}\right)f$

13. Primary pigments are :
(A) Red, Blue, Yellow   (B) Red, Cyan, Magenta

(C) Yellow, Cyan, Magenta   (D) Blue, Cyan, Magnet

14. The place where nuclear power plant is not situated is :
(A) narora   (B) Tarapur   (C) Kota   (D) Bhopal

15. When Fe is rusted then Fe is

(a) Oxidised   (b) Reduced   (c) Hydrolysed   (d) Precipitated

16. Oxidation of which of the following element is not possible

(a) F   (b) Cl   (c) Br   (d) I

17. Aqua Regia means

(a) Hard water   (b) Heavy water   (c) Royal water   (d) Soft water

18. Acid with Unit concentration has pH

(a) Zero   (b) One   (c) Seven   (d) Fourteen

19. Oxidation number of oxygen in Hydrogen peroxide is

(a) 0   (b) -1   (c) -2   (d) 2

20. Fermentation is type of Reaction

(a) Combination   (b) Decomposition

(c) Displacement   (d) Double displacement

21. Malachite is an Ore Of
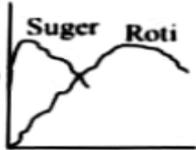
(a) Cu   (b) Zn   (c) Al   (d) Mg
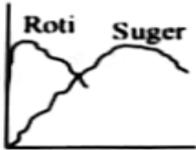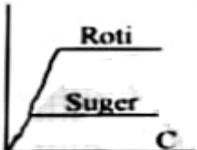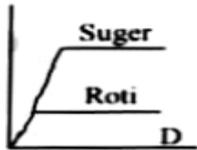
22. Which Metal is Use as catalyst in Hydrogenation of oil?

   (a)   Mg   (b)   Fe   (c)   Cu   (d)   Ni

23. Margarine is

   (a)   Artificial butter   (b)   Artificial fibre

   (c)   Artificial Silk   (d)   Vanaspati Ghee

24. Halogens are present in

   (a)   Group 16   (b)   Group 17

   (c)   Group 18   (d)   Group 15

25. Basicity of Acetic acid is

   (a)   1   (b)   2   (c)   3   (d)   4

26. Sting of wasp is

   (a)   Acidic   (b)   Basic   (c)   Neutral   (d)   None of these

27. Carbon is present in group number

   (a)   13   (b)   14   (c)   15   (d)   18

28. The percentage of Carbon in Earth crust is

   (a)   0.02 %   (b)   0.03%   (c)   0.04%   (d)   0.05%

PART – IV : BIOLOGY

1. Excess slat inhibits bacterial growth in pickles by :-
   (a) endosmosis   (b) exosmosis   (c) oxidation   (d) denaturation

2. Restriction endonucleases are enzymes that are used by biotechnologists to :-
   (a)   cut DNA at specific base sequences   (b)   join fragments of DNA
   (c)   digest DNA from the 3′ end   (d)   digest DNA from the 5′ end

3. Enzyme X extracted from the digestive system hydrolyses peptide bonds. Which of the following are probable candidates to be enzyme X :-
   (a)   Amylase   (b)   Lipase   (c)   Trypsin   (d)   Maltase

4. A person with blood group AB has :-
   (a) antigen A and B on RBCs and both anti-A and anti-B antibodies in plasma
   (b) antigen A and B on RBCs but neither anti-A nor anti-B antibodies in plasma
   (c) no antigen on RBCs but both anti-A and anti-B antibodies present in plasma
   (d) antigen A on RBCs and anti-B antibodies in plasma

5. Glycolysis is the breakdown of glucose to pyruvic acid. How many molecules of pyruvic acid are formed from one molecule of glucose :-
   (a) 1   (b) 2   (c) 3   (d) 4

6. The process of transfer of electrons from glucose to molecular oxygen in bacteria and mitochondria is known as :-
   (a) TCA cycle   (b) Oxidative phosphorylation
   (c) Fermentation   (d) Glycolysis

7. Considering the average molecular mass of a base to be 500 Da, what is the molecular mass of a double stranded DNA of 10 base pairs :-
   (a) 500 Da   (b) 5 kDa   (c) 10 kDa   (d) 1 kDa

8. Which of the following graphs accurately represents the insulin levels (Y-axis) in the body as a function of time (X-axis) after eating sugar and bread/roti?

   (a)   (b)   (c)   (d)

9. You marked two ink-spots along the height at the base of a coconut tree and also at the top of the tree. When you examine the spots next year when the tree has grown taller, your will sec-
   (a) the two spots at the top have grown more apart than the two spots at the bottom
   (b) the top two spots have grown less apart then the bottom two spots
   (c) both sets of spots have grown apart to the same extent
   (d) both sets of spots remain un-altered

10. The amino acid sequences of a bacterial protein and a human protein carrying out similar function are found to be 60% identical. However the DNA sequences of the genes coding for these proteins are only 45% identical. This is possible because-
    (a) Protein sequence does not depend on DNA sequence
    (b) DNA codons having different nucleotides in the third position can code for the same amino acids
    (c) DNA codons having different nucleotides in the second position can code for the same amino acids
    (d) Same DNA codons can code for multiple amino acids

11. Which gas does not produces green house effect
    (a) Carbondioxide (b) Methane (c) Hydrogen (d) Chloro-Fluro-Carbon

12. 'The Ganga Action Plan' was started in the-
    (a) 1980 (b) 1986 (c) 1960 (d) 1970

13. Deficiency of Vitamine 'C' causes-
    (a) Beriberi (b) Night blindness (c) Blue eyes (d) Scurvy

14. Fat is completely digested in the-
    (a) Stomach   (b) Mouth
    (c) Small intestine   (d) Large intestine