SAMPLE PAPER

Aakash
NATIONAL
TALENT HUNT EXAM
ANTHE
2018

for Class IX & X Studying Students

Science, Mathematics & Mental Ability

Aakash
Medical| IIT-JEE| Foundations
(Divisions of Aakash Educational Services Limited)

Registered Office: Aakash Tower, 8, Pusa Road, New Delhi-110005. Ph.: (011) 47623456 Fax: (011) 47623472
1. Two stones, having masses in the ratio of 3 : 2, are dropped from the heights in the ratio of 4 : 9. The ratio of magnitudes of their linear momenta just before reaching the ground is (neglect air resistance)
   (1) 4 : 9 (2) 2 : 3 (3) 3 : 2 (4) 1 : 1

2. Two point masses $M$ and $3M$ are placed at a distance $L$ apart. Another point mass $m$ is placed in between on the line joining them so that the net gravitational force acting on it due to masses $M$ and $3M$ is zero. The magnitude of gravitational force acting due to mass $M$ on mass $m$ will be
   (1) \( \frac{G M m (1 + \sqrt{3})^2}{L^2} \)
   (2) \( \frac{3 G M m}{L^2 (1 + \sqrt{3})} \)
   (3) \( \frac{G M m (1 - \sqrt{3})^2}{L^2} \)
   (4) \( \frac{G M m (1 - \sqrt{3})}{L^2} \)

3. Two persons just manage to push a block from left to right direction along a horizontal level road with uniform velocity. When the same block is pushed by three persons in same direction a constant acceleration of 0.2 ms\(^{-2}\) is produced in the block. If the five persons push the block in same direction together, then the magnitude of acceleration of the block will be [Assume that each person applies the force equal in magnitude]
   (1) 0.4 ms\(^{-2}\) (2) 0.6 ms\(^{-2}\) (3) 0.8 ms\(^{-2}\) (4) 1 ms\(^{-2}\)

4. If the displacement of a particle is equal to zero, then its distance
   (1) Must be equal to zero
   (2) Can't be equal to zero
   (3) Can be negative
   (4) May or may not be equal to zero

5. Velocity-time graph of a block of mass 100 g sliding on a horizontal concrete floor under the action of a constant force of 5 N is shown below. The magnitude of frictional force acting on the block due to the floor is
   (1) 4 N (2) 5 N (3) 3 N (4) Zero

6. The boiling point of a liquid X is 20°C more than that of water. Boiling point of X is
   (1) 353 K (2) 373 K (3) 393 K (4) 120 K
7. The physical state of matter that consists of super energetic and super excited particles in the form of ionised gases is
   (1) Solid
   (2) Liquid
   (3) Plasma
   (4) Gas

8. Consider the following diagram.

   ![Diagram of beakers A to D with 10 mL transfers]

   In beaker A, a solution is made by dissolving 2-3 crystals of potassium permanganate in 100 mL of water. 10 mL of this solution is added in another beaker 'B' and the volume is made 100 mL by adding water. Same process is repeated again by taking 10 mL of solution from beaker B to C and subsequently from beaker C to D. The solution with the least concentration is
   (1) A  (2) B  (3) C  (4) D

9. Consider the following box

   Fog, Mist, Sponge, Clouds, Pumice

   Total number of aerosols is
   (1) Two
   (2) Three
   (3) Four
   (4) Five

10. Pehal and Ishaan were making 100 g sugar solutions with concentration by mass 20% and 50% respectively. Pehal added 20 g of sugar in her solution whereas Ishaan evaporated 20 g of water from his solution. Now, the two solutions were mixed to form a final solution. The concentration by mass of final solution is
   (1) 28%  (2) 45%
   (3) 40%  (4) 60%

11. Select the incorrect statement regarding that organelle of animal cell which has its own DNA and ribosomes.

   (1) The energy required for various chemical activities needed for life is released by it in the form of ATP molecules
   (2) Its outer membrane is deeply folded while the inner membrane is very porous
   (3) Its deeply folded membrane creates a large surface area for ATP-generating chemical reactions
   (4) It is able to make some of its own proteins

12. Hard matrix of a particular type of connective tissue is composed of calcium and phosphorus compounds. The cells embedded in this matrix are

   (1) Fibroblasts
   (2) Osteocytes
   (3) Chondrocytes
   (4) Mast cells

13. Four sugar solutions A, B, C and D of different sugar concentrations were taken to perform an experiment at constant temperature to show the phenomenon of osmosis. After few hours, the changes in the level of solutions observed are depicted by the given diagrams.
According to the observation, correct order of sugar concentration of those solutions is

(1) A > C = B > D   (2) A > D = B > C   
(3) D > B = C > A   (4) C = B > D > A

14. The cells of which tissue differentiate to form different types of permanent tissue?

(1) Sclerenchyma tissue   (2) Collenchyma tissue   
(3) Parenchyma tissue   (4) Meristematic tissue

15. Amongst them, who classify all living organisms into five kingdoms?

(1) Ernst Haeckel   (2) Robert Whittaker   
(3) Carl Woese   (4) Charles Darwin

### SECTION-B : MATHEMATICS

16. If \(a^b = b^c = ab\), then \(b + c\) always equals

(1) \(\frac{1}{bc}\)   (2) \(\frac{1}{2} bc\)   
(3) 1   (4) \(bc\)

17. Which of the following is a factor of \(2x^4 + 1 + 3x^2\)?

(1) \(1 + 2x^2\)   (2) \(4 + x^2\)   
(3) \(2x^2 - 1\)   (4) \(3 + x^2\)

18. The graph of the equation \(5x - 3y = 10\) cuts the \(x\)-axis at the point

(1) \(0, \ -\frac{10}{3}\)   (2) \((-2, \ 0)\)   
(3) \((2, \ 0)\)   (4) \((0, \ 0)\)

19. If \(p\) and \(q\) are two distinct irrational numbers, then which of the following is always an irrational number?

(1) \(\frac{p}{q}\)   (2) \(pq\)   
(3) \((p + q)^2\)   (4) \(\frac{p^2 + q^2 + pq}{pq}\)

20. In the given figure, if \(r \parallel s\), \(p \parallel q\) and \(u \parallel t\), then \(c\) equals

\[ \begin{align*}
\text{(1) } & a + b \\
\text{(2) } & 2a + b \\
\text{(3) } & a - b \\
\text{(4) } & b - a
\end{align*} \]
21. If \( 8a - 64b - c = 24\sqrt[3]{abc} \), where \( a, b, c \neq 0 \), then which of the following can be true?

(1) \( 2\sqrt[3]{a} - 4\sqrt[3]{b} - \sqrt[3]{c} = 0 \)

(2) \( 2\sqrt[3]{a} = 4\sqrt[3]{b} = \sqrt[3]{c} \)

(3) \( a + b + c = 0 \)

(4) \( a = b = c \)

22. In the given figure, if \( AB \) intersects \( CD \) at \( O \), \( CB \parallel AD \parallel EF \parallel GH = BH = AE \) and \( OH = OE \), then which of the following is not always correct?

(1) \( BC = AD \)

(2) \( OC = OD \)

(3) \( GH = EF \)

(4) \( OB = OD \)

23. A tile is in the shape of a rhombus whose diagonals are \( (x + 5) \) units and \( (x - 8) \) units. The number of such tiles required to tile on the floor of area \( (x^2 + x - 20) \) sq. units is

(1) \( \frac{2(x + 6)}{x + 2} \)

(2) \( \frac{x + 4}{x - 2} \)

(3) \( \frac{2(x - 4)}{x - 8} \)

(4) \( \frac{x - 8}{x + 2} \)

24. In the given figure, \( \triangle ABC \equiv \triangle EDA \). If \( X \) and \( Y \) are points lying on \( AD \) and \( EG \) respectively such that \( \frac{AX}{XC} = \frac{EY}{YG} = 1 \). The value of \( \frac{DX}{FY} \) is always

(1) Greater than 1

(2) Equal to 1

(3) Less than 1

(4) Equal to \( \frac{3}{2} \)

25. In the given \( \triangle ABC \), \( E \) is a point on \( AD \). If \( \angle AEB \), \( \angle ADB \) and \( \angle ACD \) are equal to \( 180^\circ - k_1 \), \( 180^\circ - k_2 \) and \( 180^\circ - k_3 \) respectively, then \( k_1 : k_2 : k_3 \) equals

(1) \( 1 : 2 : 3 \)

(2) \( 2 : 3 : 4 \)

(3) \( 3 : 4 : 5 \)

(4) \( 1 : 3 : 5 \)
26. An insect moves in a field as shown in the following diagram. If the insect starts moving towards east initially, then finally it is moving towards

![Diagram]

(1) South-West  (2) South-East
(3) North-West  (4) North-East

27. Which figure will replace ‘?’ in the following figure matrix?

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<table>
<thead>
<tr>
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(1)  (2)  (3)  (4)

28. The number which replaces ‘?’ in the following pattern is

![Pattern]

(1) 18  (2) 28  (3) 144  (4) 164

29. A person threw a standard dice 3 times. He obtained two distinct odd prime numbers in two throws and an even number which is not a factor of 18 in the third throw. The sum of all the numbers on the opposite faces of numbers obtained in the three throws is

(1) 9  (2) 12  (3) 10  (4) 15

30. Mr. Smith has a bag A. Bag A has \(n\) numbers of bag B. Each bag B has \(n\) numbers of bag C. Each bag C has \(n\) numbers of one rupee coins in it. If one bag B is removed from bag A, then the total number of coins left in bag A is

(1) \(n(n - 1)(n + 1)\)
(2) \(n(n - 1)\)
(3) \(n^2(n + 1)\)
(4) \(n^2(n - 1)\)
Aakash National Talent Hunt Exam 2018
(For X Studying)

(SECTION-A : SCIENCE)

1. The power of engine of a car of mass 1200 kg is 25 kW. The minimum time required to reach a velocity of 90 km/h by the car after starting from rest is
   (1) 15 s (2) 25 s (3) 60 s (4) 12 s

2. The effective resistance in between the points A and B in the circuit given below is

   ![Circuit Diagram]

   (1) 23 Ω (2) 32 Ω (3) 12 Ω (4) 45 Ω

3. In the arrangement given below, there are two rectangular glass slabs placed side by side as shown. A ray of light is incident from air onto the surface of glass slab-1 having refractive index $\mu_1$ at an angle of incidence $i$. Thereafter, it moves through glass slab-2 of refractive index $\mu_2$ and after emerging from the glass slab-2, it reflects from a smooth horizontal plane mirror. The angle $\theta$ which reflected ray makes with the mirror is

   ![Ray Diagram]

   (1) $\frac{\mu_2}{\mu_1}(90^\circ - i)$ (2) $\frac{\mu_2}{\mu_1}i$
   (3) $i$ (4) $90^\circ - i$

4. Choose the incorrect statement among the following.
   (1) When a body is immersed fully or partially into a fluid, it experiences an upward force that is equal to weight of the fluid displaced by it
   (2) A stone is tied with a light spring balance using a light string. As this stone is slowly lowered into the water, the reading of the spring balance decreases till it touches the bottom of the container as shown in the figure given below

   ![Spring Balance Diagram]

   (3) Lactometer is used to measure the purity of a sample of milk
   (4) The density of the object can be measured in kg/cm$^3$

5. A concave lens is required to correct
   (1) Myopia (2) Presbyopia (3) Hypermetropia (4) Cataract

6. Four moles of a compound 'X' weigh 176 g. Compound 'X' is
   (1) CO (2) CH$_4$ (3) CO$_2$ (4) NaCl

Space for Rough Work
7. On the basis of given information, identify 'X'.

<table>
<thead>
<tr>
<th>Atomic No.</th>
<th>Mass No.</th>
<th>No. of Electrons</th>
<th>No. of Protons</th>
<th>No. of Neutrons</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>A</td>
<td>B</td>
<td>X</td>
</tr>
</tbody>
</table>

(1) H  (2) He  (3) H⁺  (4) He²⁺

8. Addition of water to calcium oxide, is an example of both

(1) Combination and endothermic reaction
(2) Combination and exothermic reaction
(3) Decomposition and endothermic reaction
(4) Decomposition and exothermic reaction

9. Rajat and Ashima have got two different solutions A and B respectively. The concentration of hydronium ion is more in case of solution A. Solution B turns pink in the presence of phenolphthalein while A turns the colour of pH paper orange. The pH of solutions A and B can respectively be

(1) 7, 13  (2) 13, 14
(3) 2, 14  (4) 14, 13

10. 'X' and 'Y' are two metallic elements. 'Y' is more reactive than 'X'. The reaction of 'Y' with iron oxide is highly exothermic and is used to join railway tracks. 'Y' does not react with hot or cold water but reacts with steam to form its oxide. 'X' reacts with sodium hydroxide to produce a gas 'Z' which burns with pop sound. 'X' is also a constituent of brass. Which of the following statements are not correct for 'X', 'Y' and 'Z'?  

(i) 'Y' is aluminium and 'X' is copper.  
(ii) Oxides of 'X' and 'Y' are amphoteric.  
(iii) 'Y' forms a compound with formula YCl₃ with chlorine.  
(iv) 'X' is used for galvanisation.  
(v) 'Z' is oxygen.

(1) (i), (ii) & (iii)  (2) (ii), (iii) & (iv)  (3) (i) & (iv)  (4) (i) & (v)

11. Select the correct option w.r.t. excretory parts that occur in pairs in human beings.

(1) Ureter, urethra and urinary bladder
(2) Urinary bladder and urethra only
(3) Kidney and ureter
(4) Urethra and kidney

12. Match the following symptoms/conditions with their associated endocrine glands labelled as A, B, C, D and E in the outline sketch of human being as given below and select the correct option.

(a) Increases heart rate.
(b) Regulates carbohydrate, protein and fat metabolism.
(c) High blood sugar level.
(d) Faster breathing rate.

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<td>(b)</td>
<td>(c)</td>
<td>(d)</td>
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<td>(1)</td>
<td>C</td>
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<td>D</td>
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<td>(2)</td>
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<td>E</td>
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<tr>
<td>(3)</td>
<td>D</td>
<td>C</td>
<td>E</td>
</tr>
<tr>
<td>(4)</td>
<td>A</td>
<td>B</td>
<td>D</td>
</tr>
</tbody>
</table>

Space for Rough Work
13. Identify the odd one out from I, II and III separately and select the correct option for those odd ones.
   I. Intestinal juice, Pancreatic juice, Saliva, Bile juice.
   II. Mucus, Pepsin, Trypsin, Lipase.
   III. Amino acid, Glycerol, Hydrochloric acid, Glucose.
   (1) Intestinal juice, Lipase, Glucose
   (2) Saliva, Trypsin, Amino acid
   (3) Bile juice, Pepsin, Amino acid
   (4) Bile juice, Mucus, Hydrochloric acid

14. At higher altitudes, air becomes rarer and amount of oxygen per litre of air decreases. Increase in all of the following would compensate this decrease for performing normal biological functions of our body, except
   (1) The concentration of haemoglobin
   (2) The number of red blood cells
   (3) The temperature of the body
   (4) The rate of breathing

15. Which among the following organisms divide into many daughter cells simultaneously by multiple fission?
   (1) Amoeba
   (2) Plasmodium
   (3) Hydra
   (4) Planaria

SECTION-B : MATHEMATICS

16. If \(a^2 + b^2 + c^2 = 14\), then \(ab + bc + ca\) is always greater than or equal to
   (1) 0
   (2) 14
   (3) –1
   (4) –7

17. In the given figure, if \(ABC\) is a triangle, \(D\) and \(E\) are the points on \(BC\) such that \(\triangle ADC \sim \triangle AEB\), then \(\frac{AD}{AE}\) is always equal to

   \(\frac{AB}{CE}\) (2) \(\frac{AC}{AB}\)
   (3) \(\frac{AD}{CE}\)
   (4) \(\frac{CE}{AD}\)

18. The value of \(\frac{1}{2 + \sqrt{7}} + \frac{1}{\sqrt{7} + \sqrt{10}} + \ldots + \frac{1}{\sqrt{28} + \sqrt{31}}\) is
   (1) \(\frac{4 - \sqrt{28}}{3}\)
   (2) \(\frac{2 - \sqrt{31}}{3}\)
   (3) \(\frac{\sqrt{28} - 4}{3}\)
   (4) \(\frac{\sqrt{31} - 2}{3}\)

19. A cylindrical vessel open at the top has a base diameter 56 cm. If the total cost of painting the outer curved surface of the vessel is `352 at the rate of `0.2 per 100 cm\(^2\), then the height of the vessel is
   (1) 15 m
   (2) 10 m
   (3) 6 m
   (4) 12 m

20. Out of the given four quadrilaterals, in which of the following, the diagonals always bisect each other at right angles?
   (1) Trapezium
   (2) Rhombus
   (3) Rectangle
   (4) Kite

21. If the HCF and LCM of 48 and 56 are respectively \(h\) and \(l\), then the value of \(\frac{l}{h}\) is
   (1) 40
   (2) 42
   (3) 36
   (4) 44

22. The system of linear equations \(5x + my = 10\) and \(4x + ny = 8\) have infinitely many solutions, where \(m\) and \(n\) are positive integers. Then, the minimum possible value of \((m + n)\) is equal to
   (1) 9
   (2) 5
   (3) 6
   (4) 10
23. The quadratic equation \( abx^2 + acx + b(bx + c) = 0 \) has non-zero equal and rational roots. The values of \( a \) and \( c \) respectively cannot be equal to \((ab \neq 0)\) 
- (1) 4 & 49 
- (2) 49 & 16 
- (3) 4 & 64 
- (4) 8 & 49

24. The value of \[ \left( \frac{\tan 30^\circ \cdot \sin 60^\circ \cdot \csc 30^\circ}{\sec 0^\circ \cdot \cot 60^\circ \cdot \cos 30^\circ} \right)^{-4} \] is equal to 
- (1) 8 
- (2) \(3\sqrt{2}\) 
- (3) 4 
- (4) 16

SECTION-C : MENTAL ABILITY

26. If EXTRANEOUS \( \Rightarrow \) XEOENARTSU, then PERFECTION \( \Rightarrow \) ? 
- (1) EPITECGRNO 
- (2) EPICTEFRNO 
- (3) EPITCEFRNO 
- (4) EIPTCEFRNO

27. Out of the following four options, three possess the same property, while one is different from the others. Choose the correct odd option. 
- (1) Atal Bihari Vajpayee 
- (2) Narendra Modi 
- (3) Dr. Manmohan Singh 
- (4) Dr. Rajendra Prasad

28. The value of ‘\( a \)’ in the following pattern is 

\[
\begin{array}{cccccc}
2 & 4 & 16 & 39 & \text{a} \\
10 & 16 & 15 & 20 & \\
\end{array}
\]

- (1) 71 
- (2) 16 
- (3) 25 
- (4) 61

Directions : (Q.29 to Q.30)

Read the given table and answer the following questions. In this table data about the PAN allotment during FY 2013-14 is given.

<table>
<thead>
<tr>
<th>Taxpayer Status</th>
<th>PAN Allotted During FY 2013-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSOCIATION OF PERSONS</td>
<td>70,970</td>
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<tr>
<td>BODY OF INDIVIDUALS</td>
<td>4,306</td>
</tr>
<tr>
<td>COMPANY</td>
<td>1,01,973</td>
</tr>
<tr>
<td>FIRM</td>
<td>2,43,789</td>
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<td>GOVERNMENT</td>
<td>876</td>
</tr>
<tr>
<td>HUF</td>
<td>70,196</td>
</tr>
<tr>
<td>ARTIFICIAL JURIDICAL PERSON</td>
<td>1,444</td>
</tr>
<tr>
<td>LOCAL AUTHORITY</td>
<td>4,333</td>
</tr>
<tr>
<td>INDIVIDUAL</td>
<td>2,76,45,257</td>
</tr>
<tr>
<td>TRUST</td>
<td>46,308</td>
</tr>
<tr>
<td>TOTAL PAN ALLOTTED</td>
<td>2,81,89452</td>
</tr>
</tbody>
</table>

29. In which category of taxpayer status, the number of PAN allotted is fourth highest during FY 2013-14? 
- (1) FIRM 
- (2) TRUST 
- (3) HUF 
- (4) ASSOCIATION OF PERSONS

30. The difference between the number of PAN allotted to BODY OF INDIVIDUALS and LOCAL AUTHORITY is 
- (1) 69526 
- (2) 66637 
- (3) 27 
- (4) 2862

Note : Answer key of Sample Paper is available at www.aakash.ac.in & www.anthe.in
Our Results in Olympiads / Scholarship Exams

- 400 Aakashians Qualified in NTSE (Stage-I) 2017-2018
- 465 Aakashians selected in NSEs 2017
- 506 Aakashians Qualified in KVPY ( Aptitude Test) 2017
- 421 Aakashians Qualified for KVPY Fellowship Award 2017
- 150 Aakashians Qualified in NTSE (Stage-II) 2017
- 768 Aakashians Qualified in NSO (Level-I) 2017-2018
- 552 Aakashians Qualified in IMO (Level-I) 2017-2018

Our Results in Medical & Engineering Entrance Exams

- 61828 Aakashians Qualified in CBSE NEET-UG 2018
- 503 Aakashians Qualified for AIIMS 2018
- 1108 Aakashians Qualified in JEE (Advanced) 2018

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