

For Class X students (10th)

CODE: VIDWAN-LAVA-F1-02-0006

Time Allotted: 2 Hrs.

Maximum Marks : **240**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

A. General Instructions

1. This booklet is your Question paper containing **60 questions**. All questions are compulsory.
2. The question paper having Scientific Aptitude, Maths & General Science.

Marking Scheme :

+4 for correct answer **NO NEGATIVE MARKS FOR WRONG ANSWER.**

3. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
4. Fill in the boxes provided below on this page and also write your **Name & Enrollment No.** In the space provided.
5. The answer sheet, a machine-readable (OMR), is provided separately.
6. **DO NOT TAMPER WITH/ MUTILATE THE OMR OR THE BOOKLET.**
7. Do not open the question-paper booklet before being instructed to do so by the invigilators.

B. Filling the OMR

8. On the Response sheet, write in Black Ball Point Pen, your name, your Enrollment No. and Name of the Centre. **Do not write these anywhere else.**
9. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
10. Use Only **Black Ball Point Pen** to Darken the OMR Sheet

FORMULA ONE TEST

Date.:20- 11 - 2016

2nd EDITION

Name of the Candidate	-----
Father's Name	-----
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SCIENTIFIC APTITUDE

01. A square tin sheet of side 24 inches is converted into a box with open top in the following steps: The sheet is placed horizontally. Then, equal sized squares, each of side x inches, are cut from the four corners of the sheet. Finally, the four resulting sides are bent vertically upwards in the shape of a box. If x is an integer, then what value of x maximizes the volume of the box?
- (a) 6
(b) 8
(c) 2
(d) 4
02. Let S_1 be a square of side a . Another square S_2 is formed by joining the mid-points of the sides of S_1 . The same process is applied to S_2 to form yet another square S_3 , and so on. If A_1, A_2, A_3, \dots be the areas and P_1, P_2, P_3, \dots be the perimeters of S_1, S_2, S_3, \dots , respectively, then the ratio $\frac{A_1 + A_2 + A_3 + \dots}{P_1 + P_2 + P_3 + \dots}$ equals
- (a) $1/2(1 + \sqrt{2})$
(b) $a/2(2 - \sqrt{2})$
(c) $a/2(2 + \sqrt{2})$
(d) $a/2(1 + 2\sqrt{2})$
03. There are two concentric circles such that the area of the outer circle is four times the area of the inner circle. Let A, B and C be three distinct points on the perimeter of the outer circle such that AB and AC are tangents to the inner circle. If the area of the triangle ABC is $\frac{9\sqrt{3}}{\pi}$ then what would be the area of the outer circle?
- (a) $9/4$
(b) $9/\pi$
(c) 12
(d) None of these
04. A farmer has decided to build a wire fence along one straight side of his property. For this purpose he has planned to place several fence-posts at 12m intervals, with post fixed at both ends of the side. After he bought the posts and wire, he found that the number of posts he had bought was 5 less than required. However, he discovered that the number of posts he had bought would be just sufficient if he spaced them 16m apart. What is the length of the side of his property and how many posts did he buy?
- (a) 200 m, 15
(b) 200m, 16
(c) 240m, 15
(d) 240m, 16

05. Consider two different cloth-cutting processes . In the first one, “n” square cloth pieces of the same size are cut from a square cloth piece of the size a ;then a circle of maximum possible area is cut from each of the smaller squares. In the second process, only one circle of maximum possible area is cut from a square of the same size and the process ends there. The cloth pieces remaining after cutting the circles are scrapped in both the processes. The ratio of the total area of scrap cloth generated in the former to that in the latter is:
- (a) 1:1
 (b) $\sqrt{2} : 1$
 (c) 2 : 1
 (d) $\frac{4n - \pi}{n(4 - \pi)}$
06. An urn contains 5 boxes. Each box contains 5 balls of different colours red, yellow, white, blue and black. Rangeela wants to pick up 5 balls of different colours, a different ball from each box. If from the first box in the first draw, he has drawn a red ball and from the second box he has drawn a black ball, find the maximum number of trials that are needed to be made by Rangeela to accomplish his task if a ball picked is not replaced.
- (a) 12
 (b) 11
 (c) 20
 (d) 60
07. In a class with boys and girls a chess competition was played wherein every student had to play 1 game with every other student. It was observed that in 36 matches both the players were boys and in 66 matches both were girls. What is the number of matches in which 1 boy and 1 girl play against each other?
- (a) 108
 (b) 189
 (c) 210
 (d) 54
08. There are three cities A,B and C. Each of these cities is connected with the other two cities by at least one direct road. If a traveller wants to go from one city (origin) to another city (destination), she can do so either by traversing a road connecting the two cities directly, or by traversing two roads, the first connecting the origin to the third city and the second connecting the third city to the destination. In all there are 33 routes from A to B (including those via C). Similarly there are 23 routes from B to C (including those via A) . How many roads are there from A to C directly?
- (a) 6
 (b) 3
 (c) 5
 (d) 10

- 09. Which of the following methods of proving a geometric figure a locus is not correct?**
- Every point on the locus satisfies the conditions and every point not on the locus does not satisfy the conditions.
 - Every point not satisfying the conditions is not on the locus and every point on the locus does satisfy the conditions.
 - Every point satisfying the conditions is on the locus and every point on the locus satisfies the conditions.
 - Every point not on the locus does not satisfy the conditions and every point not satisfying the conditions is not on the locus.
- 10. If two distinct complex numbers X_1 and X_2 and a real number w satisfies the equation $X_1(X_1 + 1) = w, X_2(X_2 + 1) = w$ and $X_1^4 + 3X_1^3 + 5X_1 = X_2^4 + 3X_2^3 + 5X_2$ then absolute value of w is :**
- 1
 - 5
 - 7
 - 9
- 11. If a, b, x and y are real number such that $ax + by = 3, ax^2 + by^2 = 7, ax^3 + by^3 = 16$ and $ax^4 + by^4 = 42$, then $ax^5 + by^5$ is :**
- 10
 - 20
 - 23
 - 58
- 12. Three pairs of real numbers $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) satisfy both equations $x^3 - 3xy^2 = 2005$ and $y^3 - 3x^2y = 2004$, then the value of $\frac{y_1 y_2 y_3}{2(y_1 - x_1)(y_2 - x_2)(y_3 - x_3)}$ is :**
- 510
 - 237
 - 501
 - 637
- 13. Let x_1, x_2 be the roots of quadratic equation $x^2 + ax + b = 0$ and x_3, x_4 be the roots of the quadratic equation $x^2 - ax + b - 2 = 0$. If $\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \frac{1}{x_4} = \frac{5}{6}$ and $x_1 x_2 x_3 x_4 = 24$, then find the value of a .**
- 10
 - 24
 - 3
 - 0

14. Let x_1, x_2, \dots, x_6 be non-negative real numbers such that $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 1$ and $x_1 x_3 x_5 + x_2 x_4 x_6 \geq \frac{1}{540}$. If the maximum possible value of $x_1 x_2 x_3 + x_2 x_3 x_4 + x_3 x_4 x_5 + x_4 x_5 x_6 + x_5 x_6 x_1 + x_6 x_1 x_2$ can be

expressed as $\left(\frac{p}{q}\right)$ (where p and q are coprime, then $(p + q)$ is:

- (a) 534
 - (b) 559
 - (c) 623
 - (d) 567
15. Given that $x_1 = 211, x_2 = 375, x_3 = 420, x_4 = 523, x_5 = 267$ and $x_n = x_{n-1} - x_{n-2} + x_{n-3} - x_{n-4}$ (when $n \geq 5$) then the value of $|x_{2015} + x_{2016} + x_{2017}|$ is:
- (a) 319
 - (b) 287
 - (c) 339
 - (d) 389

MATHEMATICS

16. Number of integral x satisfying the equation $(x^2 - 5x + 5)^{x+5} = 1$ is:

- (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
17. Let a, b, c, x are real number such that $(a + b)(b + c)(c + a) \neq 0$ and $\frac{a^2}{a + b} = \frac{a^2}{a + c} + 20$,

$\frac{b^2}{b + c} = \frac{b^2}{b + a} + 14$ and $\frac{c^2}{c + a} = \frac{c^2}{c + b} + x$, then the value of x is:

- (a) -30
 - (b) -32
 - (c) -33
 - (d) -34
18. If α and β are the roots of equation $x^2 - a(x + 1) - b = 0$ where $a, b \in \mathbb{R} - \{0\}$ and $a + b \neq 0$, then the

value of $\frac{1}{\alpha^2 - a\alpha} + \frac{1}{\beta^2 - a\beta} - \frac{2}{a + b}$ is equal to:

- (a) $\frac{4}{a + b}$
- (b) $\frac{2}{a + b}$
- (c) 0
- (d) $\frac{1}{a + b}$

19. If the equation $\sin^2 x - a \sin x + b = 0$ has three real and distinct roots in $(0, \pi)$, then the true set of values of b is equal to:

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

20. If $x + y + z = 0$, then the value of $\frac{(x^2 + y^2 + z^2)(x^5 + y^5 + z^5)}{(x^7 + y^7 + z^7)}$ is:

- (a) 1
- (b) $\frac{2}{5}$
- (c) $\frac{5}{7}$
- (d) $\frac{10}{7}$

21. A fair coin is tossed repeatedly until two consecutive heads is obtained. The probability that two consecutive heads occur on the seventh and eighth flips is equal to:

- (a) $\frac{11}{256}$
- (b) $\frac{15}{256}$
- (c) $\frac{13}{256}$
- (d) $\frac{17}{256}$

COMPREHENSION:-(22 & 23)

Mr. A Lists all the positive divisors of the number $N = (2010)^2$.

22. Number of divisors of N which are the perfect square of a positive integer is:

- (a) 15
- (b) 16
- (c) 8
- (d) None of these

23. If Mr. A randomly selects two divisors from the list then the probability that exactly one of the selected divisor is a perfect square is:

- (a) $\frac{26}{81}$
- (b) $\frac{13}{81}$
- (c) $\frac{1}{3}$
- (d) $\frac{2}{9}$

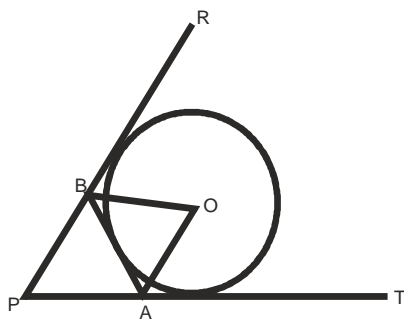
24. Points (4,-1),(6,0),(7,2) and (5,1) are joined to be a vertex of a quadrilateral . What will be the structure?

- (a) Rhombus
- (b) Parallelogram
- (c) Square
- (d) Rectangle

25. What will be the area of the rhombus $ax \pm by \pm c = 0$?

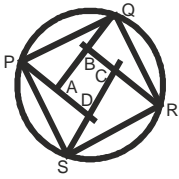
- (a) $\frac{3c^2}{ab}$
- (b) $\frac{4c^2}{ab}$
- (c) $\frac{2c^2}{ab}$
- (d) $\frac{c^2}{ab}$

26. Triangle PAB is formed by three tangents to circle O and angle APB = 40; then the angle BOA equals



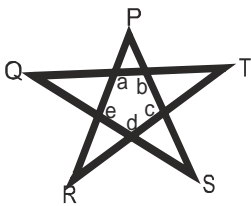
- (a) 70
- (b) 55
- (c) 60
- (d) 50

27. PQRS is a cyclic quadrilateral. The angle bisector of angle P,Q,R and S intersect at A,B,C and D as shown in the figure below. Then these four points form a quadrilateral ABCD is a:



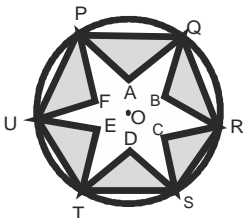
- (a) Rectangle
- (b) Square
- (c) Rhombus
- (d) Cyclic quadrilateral

28. In the adjoining figure, a star is shown. What is the sum of the angles P,Q,R,S and T?



- (a) 240
- (b) 180
- (c) 120
- (d) Can't be determined

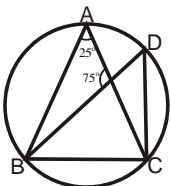
29. O is the center of the circle having radius (OP) = r, PQRSTU is a regular hexagon and PAQBRCSDTEUFP is a regular six pointed star.



Find the perimeter of hexagon PQRSTU.

- (a) 12r
- (b) 9r
- (c) 6r
- (d) 8r

30. In the figure given what is the measure of $\angle ACD$



- (a) 75°
- (b) 80°
- (c) 90°
- (d) 105°

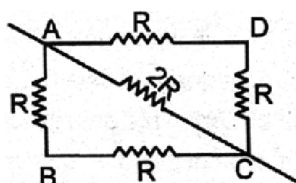
GENERAL SCIENCE

31. Under which of the following conditions, the resistance of a cylindrical specimen of an Ohmic material is least affected by small temperature variations
- Temperature coefficient of resistivity is greater than the temperature coefficient of linear expansion.
 - Temperature coefficient of resistivity is lesser than the temperature coefficient of linear expansion.
 - Temperature coefficient of resistivity equals to the temperature coefficient of linear expansion.
 - None of the above is required condition.

32. Destructive distillation of coal leads to the formation of

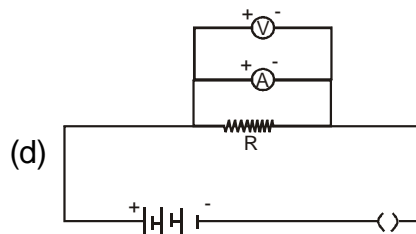
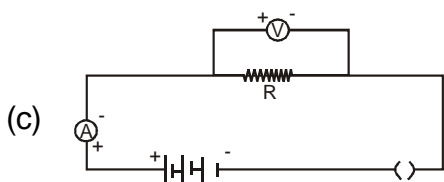
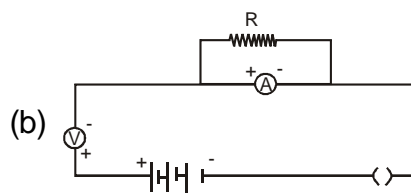
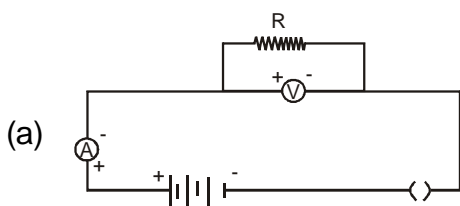
- Wood
- Kerosene
- Ammoniacal liquor
- Charcoal

33. In the given circuit, the effective resistance between points A and C will be :



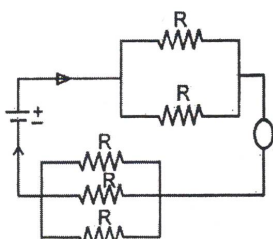
- $\frac{3}{2}R$
 - $6R$
 - $\frac{2}{3}R$
 - $3R$
34. Two wires of same material having lengths in the ratio 2 : 3 are connected in series. If the potential drops across them are 4.2V and 3.6V respectively then the ratio of their radii is
- 3 : 2
 - 7 : 6
 - $2 : \sqrt{7}$
 - $\sqrt{7} : \sqrt{6}$
35. One the basic of following features identify correct option :
- They require no material medium.
 - They are always transverse
 - they are produced by accelerating charged particles
- Mechanical waves
 - Electro magnetic waves
 - Both (I) and (II)
 - Neither (I) and (II)

36. The correct set up for studying the dependence of the current on the potential difference across a resistor is



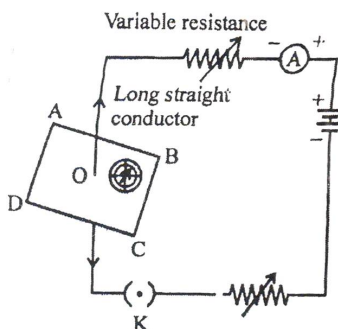
- (a) a
- (b) b
- (c) c
- (d) d

37. In the circuit given below what will be the ratio of current flowing in the upper arm 'R' and lower arm 'R'



- (a) 2/3
- (b) 5/3
- (c) 3/2
- (d) 1/5

38. If the key in the arrangement (fig) is taken out (the circuit is made open) and magnetic field lines are drawn over the horizontal plane ABCD, the lines are



- (a) Concentric circles
- (b) Elliptical in shape
- (c) Straight lines parallel to each other
- (d) Concentric circles near the point O but of elliptical shapes as we go away from it

39. Increase in number of turns of a coil in the solenoid will:

- (a) Have no effect on the strength of magnetic field
- (b) Will add to the strength of the magnetic field
- (c) Will decrease the strength of the magnetic field
- (d) Will change the direction of the magnetic field

40. Which of the following statements is not true?

- (a) The pattern of the magnetic field around a conductor due to an electric current flowing through it depends on the shape of the conductor
- (b) The magnetic field of a solenoid carrying a current is similar to that of a bar magnet
- (c) Magnitude of magnetic field is directly proportional to the quantity of current flowing through the current
- (d) Magnetic field produced by the passage of current through a straight wire is permanent

41. Match the following:

Column - A

Types of chemical reaction

- (1) Combination reaction
- (2) Decomposition reaction
- (3) Displacement reaction
- (4) Analysis reaction

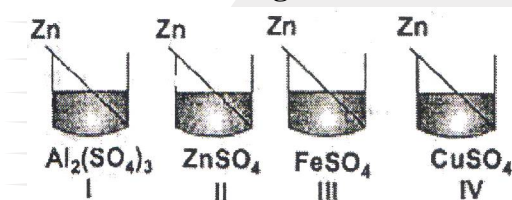
Column - B

Chemical equations

- (i) $\text{CaCO}_3 \xrightarrow{\Delta} 2\text{H}_2 + \text{O}_2$
- (ii) $2\text{H}_2\text{O} \xrightarrow{\text{Electricity}} 2\text{H}_2 + \text{O}_2$
- (iii) $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$
- (iv) $\text{Fe}(s) + \text{CuSO}_4(aq.) \rightarrow \text{FeSO}_4(aq) + \text{Cu}(s)$

- (a) 1 -- (ii), 2-- (i), 3-- (iv), 4-- (iii)
- (b) 1 -- (i), 2-- (ii), 3-- (iii), 4-- (iv)
- (c) 1 -- (iii), 2-- (i), 3 -- (iv), 4-- (ii)
- (d) 1-- (iii), 2-- (i), 3 -- (iii), 4 -- (iv)

42. Four students P, Q, R and S noted the initial colour of the solution kept in breakers I, II, III and IV. After inserting zinc rods in each solution and leaving them undisturbed for two hours, the colour of each solution was again noted in the form of table given below:

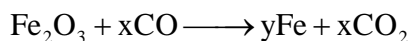


Student	Colour of the solution	I	II	III	IV
P	Initial	Colourless	Colourless	Light green	Blue
	Final	Colourless	Colourless	Colourless	Colourless
Q	Initial	Colourless	Light green	Light green	Blue
	Final	Colourless	Colourless	Colourless	Colourless
R	Initial	Colourless	Colourless	Light green	Blue
	Final	Light green	Colourless	Colourless	Light Blue
S	Initial	Light green	Colourless	Light green	Blue
	Final	Colourless	Colourless	Dark green	colourless

Which student noted the colour change in all the four beakers correctly?

- (a) P
- (b) Q
- (c) R
- (d) S

43. For the given reaction, match the column I with column II and mark the correct option from the codes given below.



COLUMN - I

- (1) Oxidising agent
 (2) Reducing agent
 (3) x
 (4) y
 (a) 1 -- (iv), 2 -- (iii), 3-- (ii), 4 -- (i)
 (b) 1 -- (iv), 2 -- (iii), 3-- (i), 4 -- (ii)
 (c) 1 -- (iii), 2-- (iv), 3-- (ii), 4 -- (i)
 (d) 1-- (iii), 2-- (iv), 3-- (i), (4) -- (ii)

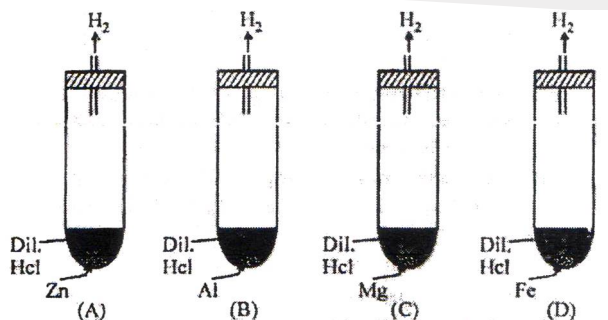
COLUMN - II

- (i) 2
 (ii) 3
 (iii) Fe_2O_3
 (iv) CO

44. In which of the following reactions H_2O_2 acts as a reducing agent:

- (1) $\text{H}_2\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow 2\text{H}_2\text{O}$ (2) $\text{H}_2\text{O}_2 + 2\text{e}^- \rightarrow \text{O}_2 + 2\text{H}^+$
 (3) $\text{H}_2\text{O}_2 + 2\text{e}^- \rightarrow 2\text{OH}^-$ (4) $\text{H}_2\text{O}_2 + 2\text{OH}^- - 2\text{e}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O}$
 (a) (1), (3)
 (b) (2), (4)
 (c) (1),(2)
 (d) (3), (4)

45. Observe the experimental setup carefully and give correct order of reactivity of these metals with dil HCl:



- (a) $C > B > A > D$
 (b) $C > A > B > D$
 (c) $D > B > A > C$
 (d) $D > A > B > C$
46. Match the following :

COLUMN - A

- (1) NaHCO_3
 (2) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
 (3) NaOH
 (4) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 (a) 1-- (i), 2-- (ii), 3-- (iii), 4-- (iv)
 (b) 1 -- (ii), 2-- (iv), 3 -- (i), d-- (iii)
 (c) 1-- (i), 2-- (iv), 3-- (ii), 4-- (iii)
 (d) 1-- (ii), 2-- (iv), 3--(iii), d -- (ii)

COLUMN - B

- (i) Caustic soda
 (ii) Baking soda
 (iii) Blue - vitriol
 (iv) Washing soda

47. Match the Column - I with Column - II and mark the correct option from the codes given below.

Column - I

- (1) NaHCO_3
 (2) Na_2CO_3
 (3) CaOCl_2
 (4) $\text{CaSO}_4, 1/2 \text{H}_2\text{O}$
 (a) 1-- (iii), 2--(i), 3-- (iv), 4 -- (ii)
 (b) 1-- (ii), 2-- (iii), 3-- (i), 4--(iv)
 (c) 1 -- (iii), 2 -- (ii), 3 -- (i), 4 -- (iv)
 (d) 1 -- (i), 2-- (ii), 3 -- (iv), 4 -- (iii)

Column - II

- (i) Used for disinfecting water
 (ii) Used in soda- acid fire extinguishers
 (iii) Used for removing permanent hardness of water
 (iv) Used for making toys, materials for decoration

48 Nitrobenzene is distilled by :-

- (a) Simple distillation
 (b) Fractional distillation
 (c) Steam distillation
 (d) None of these

49. A sugar solution contains 15% sugar by weight. When the solution is heated, 40% sugar is left in the solution. The amount of water which is disappeared is :-

- (a) 0.0625g
 (b) 62.5g
 (c) 0.625g
 (d) 6.25 g

50. In the electronic configurations of elements A and B are $1s^2, 2s^2 2p^6, 3s^1$ and $1s^2, 2s^2 2p^8, 3s^2 3p^4$ respectively, then the the formula of the compound formed by the combination of these elements will be :-

- (a) AB
 (b) AB_2
 (c) AB_2
 (d) A_2B

51. Which is correct sequence of air passage during inhalation?

- (a) Nostrills → Larynx → Pharynx → Trachea → Lungs
 (b) Nasal passage → Trachea → Pharynx → Larynx → Alveoli
 (c) Larynx → Nostrils → Pharynx → Lungs
 (d) Nostrils → Pharynx → Larynx → Trachea → Alveoli

52. The breakdown of pyruvate to give carbon dioxide , water and energy takes place in

- (a) Cytoplasm
 (b) Mitochondria
 (c) Chloroplast
 (d) Nucleus

- 53. In which of the following vertebrate group / groups, heart does not pump oxygenated blood to different parts of the body?**
- (a) Pisces and amphibians
 - (b) Amphibians and reptiles
 - (c) Amphibians only
 - (d) Pisces only
- 54. Choose the correct statement that describes arteries?**
- (a) They have thick elastic walls, blood flows under high pressure, collect blood from different organs and bring it back to the heart.
 - (b) They have thin walls with valves inside, blood flows under low pressure and carry blood away from the heart to various organs of the body
 - (c) They have thick elastic walls, blood flows under low pressure, carry blood from the heart to various organs of the body
 - (d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body
- 55. Severe acute respiratory syndrome (SARS) is**
- (a) Caused by a variant of Pheumococcus pneumoniac
 - (b) An acute form of asthma
 - (c) Caused by a variant of Corona virus
 - (d) Affect non- vegetarians faster
- 56. In which of the following region of nephron, does maximum reabsorption of useful materials occurs?**
- (a) Loop of Henle
 - (b) Glomerulus
 - (c) OCT
 - (d) PCT
- 57. Choose the right from the following:**
- A. In light, hormone auxin, helps the cells to grow longer in plants**
 - B. Plant hormone gibberellins helps in growth of a stem**
 - C. Cytokinins inhibits cell division**
 - D. Abscisic acid promote growth in plants**
- (a) A and C are correct
 - (b) B and D are correct
 - (c) A and B are correct
 - (d) A and D are correct

58. Function of sympathetic system is to

- (a) Decrease heart beat
- (b) Increase heart beat
- (c) Contact respiratory organ
- (d) Secrete saliva

59. Sequence of events which occur in a reflex action are

- (a) Receptor - motor - CNS - Sensory neuron - effector muscle
- (b) Effector muscle - CNS - sensory nerve- sensory organ
- (c) CNS- sensory neuron - motor neuron - effector muscle
- (d) Receptor - organ - sensory neuron - CNS - motor neuron - effector - muscle

60. Which of the following pairs is correctly matched?

- (a) Water - vascular system- sponge
- (b) Flame cell - flat worm
- (c) Blubber - kangaroo
- (d) Marsupium - platypus

"Dream Big, aim big

No dream is too big,

No aim is impossible"

— Dr. A.P.J. Abdul Kalam

