# VIDYAPEETH ACADEMY
**IIT JEE | NEET | OLYMPIAD | KVPY | NTSE**

**V-MAT 2021**
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

# SAMPLE TEST PAPER
# A TALENT SEARCH EXAM 2021

| Time : 2 Hours | Class : 9th_ STAGE - 2 | Max. Marks : 240 |
|---|---|---|

## INSTRUCTIONS

**DO NOT BREAK THE SEAL WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR**

**[A]    General :**

1.    Attempt ALL the questions. Answer have to be marked on the **OMR** sheets

2.    This question paper contains **60 questions**.

3.    The question paper consists of **Part-I** and **Part-II.**

4.    **Part-I** contains **Section -A** (Q.No. 1 to 20 of Mathematics) and **Section-B** (Q.No. 21 to 30 of Mental Ability)

      **Part-II** contains **Section - A** (Q.No. 31 to 40 of Physics), **Section-B** (Q.No. 41 to 50 of Chemistry ) and

      **Section-C** (Q.No. 51 to 60 of Biology)

5.    Blank spaces are provided at the bottom of each page for rough work. No additional sheets will be provided for rough work.

6.    Blank paper, clipboard, log tabes, silde rules, calculators, cellular phones, pagers and electronic gadgets in any form are **NOT** allowed.

7.    Do not Tamper / multilate the **OMR sheet** or this booklet.

8.    Do not break the seals of the question-paper booklet before instructed to do so by the invigilator.

9.    SUBMIT the OMR sheet to the invigilator after completing the test & take away the test paper with you.

**[B]    Filling of OMR Sheet :**

10.   In all the parts, each question will have 4 choices out of which **only one choice is correct**

11.   Use only Black/Blue ball point pen for filling the OMR sheet.

12.   On the OMR sheet, darken the appropriate bubble for each character of your name, Registration No., Phone No. etc.

**[C]    Marking Scheme :**

13.   For each right answer you will be **awarded 4 marks** if you darken the bubble corresponding to the corrrect answer and **zero marks** if no bubble is darkened. In case of bubbling of incorrect answer, **minus one (-1)** mark will be awarded.

## *Best of Luck*

# PART - I

## SECTION-A (MATHEMATICS)

### (SINGLE CORRECT ANSWER TYPE)

This section contains **(1-20) multiple choice questions.** Each questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Q.1    If $x^2 - 3x + 1 = 0$ find the value of $x^3 + \dfrac{1}{x^3}$.

(A)    18              (B)    27              (C)    9              (D)    36

Q.2    In the given figure, line l and m intersect at O. If $a = 46°$, then the value of $(b + 2c - d)$ is
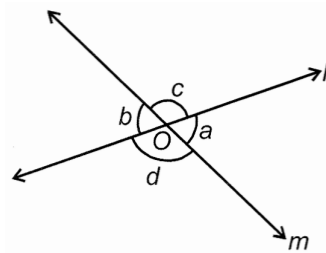


(A)    270°           (B)    164°           (C)    196°           (D)    180°

Q.3    If $a = 537, b = 538, c = 539$ find the value of $a^3 + b^3 + c^3 - 3abc$

(A)    4836           (B)    4842           (C)    3652           (D)    9672

─────── *Space for rough works* ───────

VIDYAPEETH ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Q.4   $2 - 4 + 6 - 8 + 10 - 12 + \ldots\ldots + 102$ is equal to

(A)   50          (B)   52          (C)   100          (D)   $-50$

Q.5   If $a + \dfrac{1}{a} = 2$ find the value of $a^{2017} + \dfrac{1}{a^{2017}}$

(A)   $2^{2017}$          (B)   2          (C)   2017          (D)   $-2$

Q.6   If $11^x = 3^y = 99^z$ then $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z} =$

(A)   $\dfrac{2}{z} - \dfrac{1}{y}$          (B)   $\dfrac{2}{z} + \dfrac{1}{y}$          (C)   $-\dfrac{1}{y}$          (D)   0

Q.7   What will be the remainder if $(4)^{400}$ is divided by 15.

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

Q.8   If $x = 2 + 2^{1/3} + 2^{2/3}$ then the value of $x^3 - 6x^2 + 6x + 8$

(A)   10          (B)   2          (C)   $-6$          (D)   4

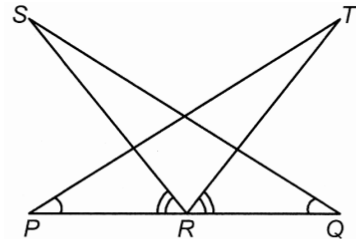Q.9   The area of an isosceles triangle having base 6 cm and length of one of the equal sides 9 cm is

(A)   $12\sqrt{2}\,\text{cm}^2$          (B)   $18\,\text{cm}^2$          (C)   $18\sqrt{2}\,\text{cm}^2$          (D)   $3\,\text{cm}^2$

──────── *Space for rough works* ────────

Q.10  If $A^{\frac{1}{A}} = B^{\frac{1}{B}} = C^{\frac{1}{C}}$, $A^{BC} + B^{AC} + C^{AB} = 729$. Which of the following equals $A^{\frac{1}{A}}$?

(A)  $\sqrt[ABC]{81}$     (B)  $\sqrt[ABC]{243}$     (C)  $\sqrt[ABC]{27}$     (D)  $\sqrt[ABC]{9}$

Q.11  In the given figure, $PR = RQ$, $\angle SQR = \angle TPR$ and $\angle SRP = \angle TRQ$. If PRQ is a line segment, then which of the following is not always true?



(A)  $\triangle SQR \cong \triangle TPR$     (B)  $SR = TR$     (C)  $\triangle RQS \cong \triangle RTP$     (D)  $SQ = PT$

Q.12  $\dfrac{(a-b)^3 - (a+b)^3}{2} + a(a^2 + 3b^2) = $ _____.

(A)  $a^3 - b^3$     (B)  $(a+b)^3$     (C)  $a^3 + b^3$     (D)  $(a-b)^3$

Q.13  Solve the equations: $4(2^{x-1}) + 9(3^{y-1}) = 17$ and $3(2^x) - 2(3^y) = 6$.

(A)  $(x, y) = (2, 1)$                     (B)  $(x, y) = (-2, -1)$

(C)  $(x, y) = (1, 2)$                     (D)  $(x, y) = (2, -1)$

*Space for rough works*

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

VIDYAPEETH ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

V-MAT
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

Q.14 The equation $\sqrt{x+1} - \sqrt{4x-1} = \sqrt{x-1}$ has

(A) no solution

(B) one solution

(C) two solutions

(D) more than two solutions

Q.15 If p,q and r are the length of the sides of a right triangle PQR and the hypotenuse $r = \sqrt{2pq}$, then $\angle QPR = _____$ .

(A) 50°     (B) 45°     (C) 60°     (D) 30°

Q.16 Meera has $x^3 + \dfrac{1}{x^3}$ chocolates with her such that $x + \dfrac{1}{x} = 6$. The number of chocolates Meera has, is

(A) 216     (B) 198     (C) 234     (D) 204

Q.17 In the following figure. ABCD is a rectangle with $AB = 9\,cm$ and $BC = 6\,cm$. O is the centre of the circle. Find the area of the shaded region. ( in $cm^2$ ).
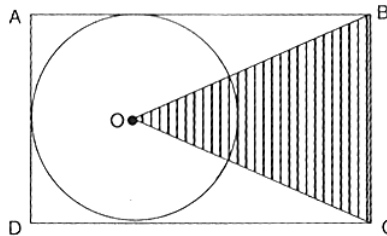


(A) 18     (B) 24     (C) 27     (D) 15

*Space for rough works*

Q.18   If the breadth of a rectangle is increased by 5 cm, its area increases by $25\,cm^2$. If its length is increased by 5cm, its area increases by $20\,cm^2$. Find the area of the rectangle (in $cm^2$).

   (A)   20               (B)   25               (C)   30               (D)   35

Q.19   The length of an arc, which subtends an angle of $30^\circ$ at the centre of the circle of radius 42 cm is _____.

   (A)   22 cm            (B)   44 cm            (C)   11 cm            (D)   $\dfrac{22}{7}\,cm$

Q.20   Rishi has $(p-q)$ number of ties which he mixes and matches with his dresses everday. p and q are related by $\dfrac{4+\sqrt{3}}{2-\sqrt{3}} = p + q\sqrt{3}$. The number of ties Rishi has

   (A)   11               (B)   6                (C)   5                (D)   4

─────────────── *Space for rough works* ───────────────

# SECTION - B (MENTAL ABILITY)

## (SINGLE CORRECT ANSWER TYPE)

This section contains **(21-30) multiple choice questions.** Each questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

**Directions** (Q. Nos.21-23) Read the following information carefully to answer the questions that follow.

A cube to 4 cm has been painted on its surfaces in such a way that two opposite surfaces have been painted blue and two adjacent surfaces have been painted red. Two remaining surfaces have been left unpainted. Now. the cube is cut into smaller cubes of side 1 cm each.

Q.21 How many cubes will have non of the sides painted

(A) 18 (B) 16 (C) 22 (D) 8

Q.22 How many cubes will have atleast one red colour on its surfaces?

(A) 20 (B) 22 (C) 28 (D) 32

Q.23 How many cubes will have atleast one blue colour on its surfaces ?

(A) 20 (B) 8 (C) 24 (D) 32

**Directions (Q. Nos.24-25)** ABCD $\times$ E = DCBA . If A, B, C, D and E represents different single digit no. from 1 to 9. then

Q.24 The value of A is

(A) A = 2 (B) A = 3 (C) A = 1 (D) A = 5

Q.25 The value of E is

(A) E = 4 (B) E = 3 (C) D = 2 (D) E = 6

━━━━━━━━━━━ *Space for rough works* ━━━━━━━━━━━

VIDYAPEETH
ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

Q.26    Total number of squares on a chess board is

(A)    204              (B)    224              (C)    64              (D)    160

**Directions (Q. Nos. 27-28)** In each of the following questions, one term in the number series is wrong. Find out the wrong term.

Q.27    2, 5, 11, 23, 45, 95

(A)    23              (B)    95              (C)    45              (D)    11

Q.28    60, 55, 45, 35, 10

(A)    55              (B)    60              (C)    35              (D)    10

Q.29    Rekha ranks eighth from the top and twenty-fifth from the last in a class. How many students are there in the class?

(A)    31              (B)    32              (C)    34              (D)    33

Q.30    If '$+$' stands for 'division', '$\div$' stands for 'multiplication', '$\times$' stands for 'subtraction' and '$-$' stands for 'addition', then which one of the following is correct?

(A)    $24 - 6 \div 7 + 5 \times 2 = 25$              (B)    $24 \times 6 \div 7 - 5 + 2 = 12$

(C)    $24 + 6 - 7 \div 5 \times 2 = 27$              (D)    $24 + 6 - 7 \times 5 \div 2 = 1$

━━━━━━━━━━  *Space for rough works*  ━━━━━━━━━━

**VIDYAPEETH** ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE
Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699
V-MAT 2021
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

# PART - II
# SECTION-A (PHYSICS)
## (SINGLE CORRECT ANSWER TYPE)

This section contains **(31-40) multiple choice questions.** Each questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

---

Q.31    A particle falls from a height h. In the last 0.2 s it travels 6m. Find the height h.( $g = 10 \, m/sec^2$ )

    (A)    48.05 m        (B)    420.05 m        (C)    32.05 m        (D)    None of these

Q.32    A partical moves half the distance with velocity 'u' and the other half with velocity 'v' in the same straight line. Determine average velocity.

    (A)   $\dfrac{u+v}{2}$        (B)   $\dfrac{uv}{u+v}$        (C)   $\dfrac{2uv}{u+v}$        (D)   $u+v$

Q.33    The block shown below is acted upon by multiple forces. The magnitude of the net force acting on it will be
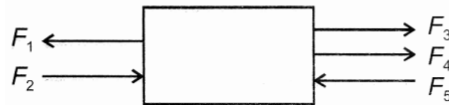


    (A)   $F_1 + F_2 - F_3 - F_4 - F_5$                (B)   $F_1 - F_2 - F_3 - F_4 + F_5$

    (C)   $F_1 - F_2 + F_3 - F_4 + F_5$                (D)   $F_1 - F_2 + F_3 + F_4 - F_5$

---

*Space for rough works*

---

**VIDYAPEETH** ACADEMY | IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT Vidyapeeth Mental Aptitude Test A Talent Search Exam 2021 6th Edition

Q.34    Which of the following speed time graph is not possible

(A)

(B)

(C)

(D)
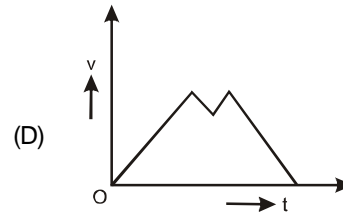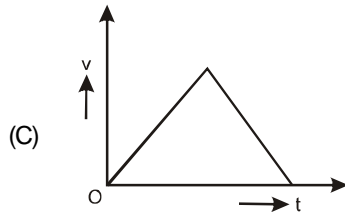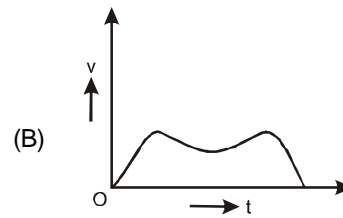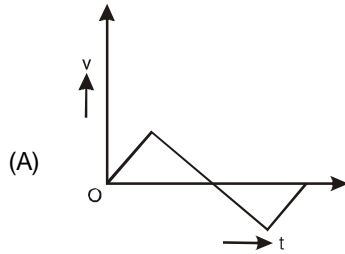
Q.35    A bullet of mass m moving with a velocity v is fired into a large wooden block of mass M. If the bullet remains embedded in the wooden block, the velocity of the system will be

(A)  $\dfrac{M}{M-m}v$       (B)  $\dfrac{M}{M+m}v$       (C)  $\dfrac{m}{M+m}v$       (D)  $\dfrac{m}{M-m}v$

Q.36    A body starts from rest and acquires a velocity v in time T.  The work done on the body in time t will be proportional to

(A)  $\dfrac{v^2}{T^2}t$       (B)  $\dfrac{v^2}{T^2}t^2$       (C)  $\dfrac{v}{T}t$       (D)  $\dfrac{v^2}{T}t^2$

*Space for rough works*

**VIDYAPEETH** ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE
Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699
V-MAT
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

Q.37 A block of mass m slides down the surface of a bowl of radius r from rim to the bottom. What will be the kinetic energy of the block at the bottom ?

(A)   mgr/2          (B)   mgr/4          (C)   2mgr          (D)   mgr

Q.38 Water is poured into a cylindrical vessel of $0.2 \, m^2$ area up to 2 m height and its upper surface is covered by a massless piston. A force of 10 N is applied on piston as shown. The increment in the pressure at a point on bottom of vessel is



(A)   50 Pa                          (B)   55 Pa

(C)   60 Pa                          (D)   65 Pa
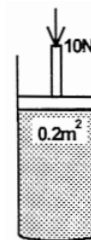
Q.39 Assume that the two liquids in the U-shape tube are water and oil. Compute the density of oil if the water stands 19 cm above the interface and oil stands 25 cm above the interface.



(A)   $670 \, kg/m^3$              (B)   $760 \, kg/m^3$

(C)   $570 \, kg/m^3$              (D)   None of these
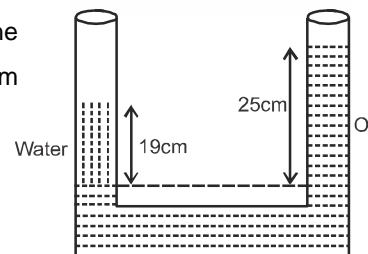
Q.40 Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the centre of the earth if it weighed 250 N on the surface?

(A)   125 N          (B)   250 N          (C)   375 N          (D)   None of these

*Space for rough works*

VIDYAPEETH ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

# SECTION-B (CHEMISTRY)

## (SINGLE CORRECT ANSWER TYPE)

This section contains **(41-50) multiple choice questions.** Each questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

---

Q.41    The total number of electrons in one molecule of carbon dioxide is

(A)    22                  (B)    44                  (C)    66                  (D)    88

Q.42    An element X has atomic number 9 and mass number 19. Its anion is represented by

(A)    $X^{2-}$              (B)    $X^-$               (C)    $X^{2+}$             (D)    $X^+$

Q.43    Convert 280 K to $^\circ C$ .

(A)    2                   (B)    5                   (C)    7                   (D)    6

Q.44    Boiling point of a substance

(A)    decreases with decreasing the pressure        (B)    decreases with increasing the presssure

(C)    increases with decreasing the pressure         (D)    All of these

Q.45    Which of the following set of compounds have the same molecular formula.

(A)    Butane and Isobutane                          (B)    Cyclohexane and 1-hexene

(C)    Propanal and propanone                        (D)    All of three options given have the same formula.

Q.46    The molecular mass of compound A is 168 g/mol. Its empirical formula is $C_4H_4S$ find its molecular formula.

(A)    $C_4H_5S$            (B)    $C_8H_8S_2$          (C)    $C_2H_2S$            (D)    $C_2H_4S$

────────────── *Space for rough works* ──────────────

**VIDYAPEETH** ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT 2021
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

Q.47    Which of the following weight is the least.

(A)    2.0 gram mole of $CO_2$                    (B)    0.1 mol of sucrose

(C)    1 gram atom of calcium                   (D)    1.5 mole of water

Q.48    Select true statement.

(A)    Fuels are materials with energy stored in the bonds of molecules

(B)    Two elements A and B form a compound with the formula $A_2B_5$. 100g of sample of a compound $A_2B_5$ contains 50 gram B. Then the ratio of atomic masses of A to atoms B is $2/5$

(C)    The is no chemical difference between iron, pig iron, cast iron and steel.

(D)    The % of water in $KAl(SO_4)_2 \cdot 12H_2O$ and $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ will be different.

Q.49    Select the incorrect statement :

(A)    out of the following atoms probably F has the smallest radius. (Rb, Na, F, Na, N).

(B)    out of the following (Rb and F) would probably form the bond with greatest ionic character (Na and N, Al and N, Al and N ; Rb and F; Rb and N)

(C)    out of the following $Al_2O_3$ has the highest melting point $(Al_2O_3, KCl, NaBr, CaCl_2)$

(D)    Ionization energy increases as we move from upper left to lower left in the periodic table.

Q.50    Which of the following statements best decribes Bohr's contribution.

(A)    Bohr's indicated that the nucleus of the atom is very small and surrounded by empty space.

(B)    Bohr's model permitted more accurate computation of spectral lines.

(C)    Bohr's model tied the energy of the electrons of specific orbits around the nucleus

(D)    Bohr's model predicted several different shapes for electron paths around the nucleus.

*Space for rough works*

**VIDYAPEETH** ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT 2021
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6$^{th}$ Edition

# SECTION-C (BIOLOGY)

## (SINGLE CORRECT ANSWER TYPE)

This section contains **(51-60) multiple choice questions.** Each questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Q.51    Which of the following structures is usually present only in animal cell ?

(A)    vacuoles                                    (B)    cell wall

(C)    nucleus                                     (D)    centrioles

Q.52    The rough ER is so named because it has an abudance of

(A)    mitochondria                                (B)    lysosomes

(C)    Golgibodies                                 (D)    ribosomes

Q.53    Cell theory was proposed by

(A)    Robert Hooke                                (B)    Beadle and tatum

(C)    Schleiden and schwann                       (D)    hargovind khorana

Q.54    The rough ER is esppecially well developed in cell actively engaged in

(A)    Protein synthesis                           (B)    Protein break down

(C)    lipid synthesis                             (D)    Seceretory runctions.

Q.55    Osmosis is defined as the movement of solvent particle through

(A)    permeable membrane                          (B)    semi permeable membrane

(C)    membrane                                    (D)    none of these

*Space for rough works*

VIDYAPEETH ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

Q.56    Double membrane is absent in

(A)    mitochondria                          (B)    chloroplast

(C)    nucleus                               (D)    lysosome

Q.57    Main difference between animal cell and plant cell

(A)    nutrition                             (B)    growth

(C)    movement                              (D)    respiration

Q.58    The largest cell in the human body is

(A)    nerve cell                            (B)    muscle cell

(C)    liver cell                            (D)    kidney cell

Q.59    Chromosomes are made up of

(A)    DNA                                   (B)    Protien

(C)    DNA and protien                       (D)    RNA

Q.60    The process that involves the fusion of membrane of vesicle with the plasma membrane to the sorrounding medium is called

(A)    endocytosis                           (B)    exocytosis

(C)    pinocytosis                           (D)    phagocytosis

━━━━━━━━━━━━━ *Space for rough works* ━━━━━━━━━━━━━

VIDYAPEETH
ACADEMY
IIT JEE | NEET | OLYMPIAD | KVPY | NTSE

Head Office: 216 & 217, 2nd Floor, Grand Plaza, Fraser Road, Dak Bunglow, Patna - 01
Website : www.vidyapeethacademy.com | E-mail : vidyapeeth@gmail.com
Contact No. : +91 8448446676, 9631835989,9431027699

V-MAT
2021
Vidyapeeth Mental Aptitude Test
A Talent Search Exam
6th Edition

# SAMPLE TEST PAPER
# ANSWER KEY V-MAT 2021 STATE – 2_ Class-9th

| | MATH | | MENTAL ABILITY | | PHY | | CHE | | BIO |
|---|---|---|---|---|---|---|---|---|---|
| Q. No. | Answer | Q. No. | Answer | Q. No. | Answer | Q. No. | Answer | Q. No. | Answers |
| 1 | A | 21 | A | 31 | A | 41 | A | 51 | C |
| 2 | D | 22 | C | 32 | C | 42 | B | 52 | D |
| 3 | B | 23 | D | 33 | B | 43 | C | 53 | C |
| 4 | B | 24 | A | 34 | A | 44 | A | 54 | A |
| 5 | B | 25 | A | 35 | C | 45 | D | 55 | B |
| 6 | A | 26 | A | 36 | B | 46 | B | 56 | D |
| 7 | D | 27 | C | 37 | D | 47 | D | 57 | A |
| 8 | A | 28 | C | 38 | A | 48 | A | 58 | C |
| 9 | C | 29 | B | 39 | B | 49 | D | 59 | C |
| 10 | B | 30 | D | 40 | A | 50 | C | 60 | D |
| 11 | C | | | | | | | | |
| 12 | D | | | | | | | | |
| 13 | A | | | | | | | | |
| 14 | B | | | | | | | | |
| 15 | B | | | | | | | | |
| 16 | B | | | | | | | | |
| 17 | A | | | | | | | | |
| 18 | A | | | | | | | | |
| 19 | A | | | | | | | | |
| 20 | C | | | | | | | | |