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

VMAT
Vidyapeeth Mental Aptitude Test
A Talent Search Exam 2019
4th Edition

SAMPLE TEST PAPER
A TALENT SEARCH EXAM 2019

Time : 2 hours | **Class : 10th_ STAGE - 2** | **Max. Marks : 240**

Name : _____ **Roll No.:** ☐☐☐☐

INSTRUCTIONS

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.

[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 **FIVE Parts Mathematics (Q.No. 1 to 20), Physics (Q.No. 21 to 30), Chemistry (Q.No. 31 to 40), Biology (Q.No. 41 to 50) & Mental Ability (Q.No. 51 to 60)**
4. Blank spaces are provided at the bottom of each page for rough work. No additional sheets will be provided for rough work.
5. Blank paper, clipboard, log tabes, silde rules, calculators, cellular phones, pagers and electronic gadgets in any form are **NOT** allowed.
6. Do not Tamper / multilate the **OMR sheet** or this booklet.
7. Do not break the seals of the question-paper booklet before instructed to do so by the invigilator.
8. SUBMIT the OMR sheet to the invigilator after completing the test & take away the test paper with you.

[B] Filling of OMR Sheet :

9. In all the parts, each question will have 4 choices out of which **only one choice is correct**
10. Use only Black/Blue ball point pen for filling the OMR sheet.
11. On the OMR sheet, darken the appropriate bubble for each character of your name, Registration No., Phone No. etc.

[C] Marking Scheme :

12. 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

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PART - I (MATHEMATICS)

(SINGLE CORRECT ANSWER TYPE)

This section contains **(1-15) multiple choice questions.** Each questions has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Q.1 If degree of both $f(x)$ and $[f(x) + g(x)]$ is 18, then degree of $g(x)$ can be

(A) 18 (B) 9 (C) 6 (D) any one of these

Q.2 If the LCM of the polynomials $f(x) = (x + 1)^5 (x + 2)^a$ and $g(x) = (x + 1)^b (x + 2)^a$ is $(x + 1)^a (x + 2)^b$, then find the minimum value of $a + b$.

(A) is 10 (B) is 14 (C) is 15 (D) Cannot say

Q.3 Ramu had 13 notes in the denominations of Rs 10, Rs 50 and Rs 100. The total value of the notes with him was Rs. 830. He has more of Rs 100 notes than that of Rs 50 notes with him. Find the number of Rs 10 notes with him.

(A) 4 (B) 3 (C) 2 (D) 5

Q.4 The cost of 2 puffs, 14 cups of coffee and 5 pizzas is Rs 356. The cost of 20 puffs, 7 cups of coffee and is 15 pizzas is Rs 830. Find the cost of 38 puffs and 25 pizzas. (in Rs)

(A) 1296 (B) 1104

(C) 1304 (D) Cannot be determined

Space for rough work

Q.5 Which of the following are the roots of $|y|^2 - |y| - 12 = 0$?

(a) 4 (b) -4 (c) 3 (D) -2

(A) Both (a) and (b) (B) Both (c) and (b)

(C) (a), (b), (c) and (d) (D) None of the above

Q.6 Find the condition to be satisfied by the coefficients of the equation $px^2 + qx + r = 0$, so that the roots are in the ratio 3 : 4 .

(A) $12q^2 = 49pr$ (B) $12q^2 = -49pr$ (C) $49q^2 = 12pr$ (D) $49q^2 = -12pr$

Q.7 Find the sum of $\frac{0.3}{0.5} + \frac{0.33}{0.55} + \frac{0.333}{0.555} + \ldots\ldots\ldots$ to 15 terms.

(A) 10 (B) 9 (C) 3 (D) 5

Q.8 Evaluate $\sum 2^i$, where $i = 2, 3, 4 \ldots\ldots 10$.

(A) 2044 (B) 2048 (C) 1024 (D) 1022

Q.9 If $\tan 86^\circ = m$, then $\frac{\tan 176^\circ + \cot 4^\circ}{m + \tan 4^\circ}$ is

(A) $\frac{m^2 - 1}{m^2 + 1}$ (B) $\frac{m^2 + 1}{1 - m^2}$ (C) $\frac{1 - m^2}{1 + m^2}$ (D) $\frac{m^2 + 1}{m^2 - 1}$

Space for rough work

Q.10 A balloon is connected to a meteorological ground station by a cable of length 215 m inclined at 60^o to the horizontal. Determine the height of the balloon from the ground. Assume that there is no slack in the cable.

(A) $107.5\sqrt{3}\,m$ (B) $100\sqrt{3}\,m$ (C) $215\sqrt{3}\,m$ (D) $215/\sqrt{3}\,m$

Q.11 The following are the steps involved in finding the value of a when $x-2$ is a factor of $3x^2-7x+a$. Arrange them in sequential order.

(a) $12-14+a=0 \Rightarrow a=2$

(b) By factor theorem, $f(2)=0 \Rightarrow 3(2)^2-7(2)+a=0$

(c) Let $f(x)=3x^2-7x+a$

(A) cba (B) bca (C) cab (D) bac

Q.12 Given ax^2+bx+c is a quadratic polynomial in x and leaves remainders 6, 11 and 18 respectively when divided by $(x+1),(x+2)$ and $(x+3)$. Find the value of $a+b+c$.

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

Q.13 The arithmetic mean of the series $1, 3, 3^2, ...3^{n-1}$ is _____ .

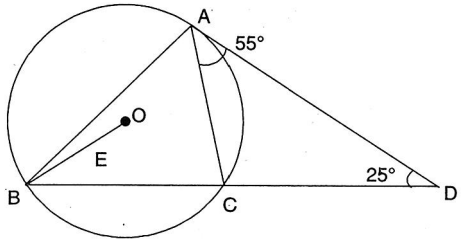
(A) $\frac{3^n}{2n}$ (B) $\frac{3^n-1}{2n}$ (C) $\frac{3^{n-1}}{n+1}$ (D) None of these

Q.14 The mean height of 25 boys in a class is 150 cm, and the mean height of 35 girls in the same class is 145 cm. The combined mean height of 60 students in the class is _____(approximately).

(A) 143 (B) 146 (C) 147 (D) 145

Space for rough work

Q.15 In the shown figure, O is the centre of the circle and AD is a tangent to the circle at A. If $\angle CAD = 55^\circ$ and $\angle ADC = 25^\circ$, then $\angle ABO =$



(A) 10° (B) 15° (C) 20° (D) 25°

Q.16 In ΔPQR, $PQ = 6\,cm$, $PR = 9\,cm$, $PR = 9$ cm and M is a point on QR such that it divides QR in the ratio $1:2$. $PM \perp QR$. Find QR.

(A) $\sqrt{18}\,cm$ (B) $3\sqrt{12}\,cm$ (C) $3\sqrt{15}\,cm$ (D) $\sqrt{20}\,cm$

Q.17 The base of a pyramid is an n-sided regular polygon of area $360\ cm^2$. The total surface area of the pyramid is $900\ cm^2$. Each lateral face of the pyramid has an area of $300\ cm^2$. Find n.

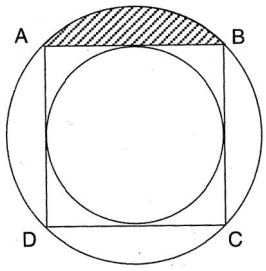
(A) 20 (B) 18 (C) 16 (D) 24

Q.18 The outer radius and inner radius of a 30 cm long cylindrical gold pipe are 14 cm and 7 cm respectively. It is filled with bronze. The densities of gold and bronze are $20\,gm/cm^3$ and $30\ gm/cm^3$ respectively. Find the weight of the cylinder formed.(in gm).

(A) 66150π (B) 99225π (C) 132300π (D) 198450π

Space for rough work

Q.19 In the following figure, a circle is inscribed in square ABCD and the square is circumscribed by a circle. If the radius of the smaller circle is r cm, then find the area of the shaded region (in cm^2).



(A) $\left(\frac{\pi-2}{4}\right)r^2$ (B) $\left(\frac{3\pi-4}{2}\right)r^2$ (C) $\left(\frac{\pi+2}{4}\right)r^2$ (D) $\left(\frac{\pi-2}{2}\right)r^2$

Q.20 The Independence day of India in 2007 was celebrated on a Wednesday, then Children's day in 2008 was celebrated on a _____.

(A) Friday (B) Saturday (C) Sunday (D) Monday

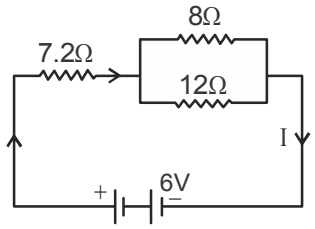
Space for rough work

PART - II (PHYSICS)

(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.

Q.21 In the given circuit, the value of total current I passing will be :



(A) 1.0 A (B) 0.5 A (C) 0.2 A (D) 2.0 A

Q.22 The area under the velocity-time graph and time axis gives the value of :

(A) velocity (B) acceleration (C) distance (D) displacement

Q.23 Echo is produced due to :

(A) reflection of sound (B) resonance

(C) refraction of sound (D) None of these

Q.24 Which of the following is not a unit of force?

(A) Dyne (B) Kg m s^{-2} (C) g cm s^{-2} (D) Kg m^2 s^{-2}

Space for rough work

Q.25 How many electrons constitute current of one micro ampere in one second ?

(A) 6.25×10^6 (B) 6.25×10^{12} (C) 6.25×10^9 (D) 6.25×10^{15}

Q.26 The velocity of an object is direcly proportional to the time elapsed, the object has :

(A) uniform speed (B) uniform velocity

(C) uniform acceleration (D) variable acceleration

Q.27 The atmosphere is held to the earth due to :

(A) Winds (B) Clouds (C) Gravity (D) Rotation of earth

Q.28 The weight of a block in air is 60 N. When it is immersed in water completely its weight is 52 N. Buoyant force on the block is (in Newtons):

(A) 52 (B) 60 (C) 8 (D) 112

Q.29 The S.I. unit of magnetic field intensity is -

(A) Weber (B) Tesla (C) Oersted (D) Gauss

Q.30 A Force of 4 N acts on a body of mass 40 kg for distance of 2m. The kinetic energy acquired by the body is :

(A) 16 J (B) 32×10^8 erg (C) 8 J (D) 32 erg

Space for rough work

PART - III (CHEMISTRY)

(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.

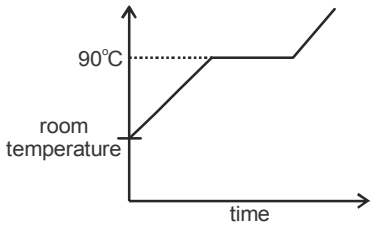
Q.31 The number of molecules in 5.65 g of ammonia is approximately $x \times 10^{23}$. What is the value of x ?

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

Q.32 How many total protons are found in one molecule of retional $(C_{20}H_{30}O)$?

(A) 51 (B) 151 (C) 600 (D) 158

Q.33 The graph shows the temprature change of solid 'A' ;



Which of the following set of statements is correct for solid 'A' at $90^{\circ}C$?

(A) The solid 'A' is undergoing a change of state.

(B) Solid 'A' is an impure substance.

(C) Solid 'A' is a pure substance.

(D) Solid 'A' is has a fixed melting point.

(A) A only (B) A & D (C) A, B & D (D) A, C & D

Space for rough work

Q.34 Acetic acid was added to a solid X kept in a test tube. A colourless and odourless gas Y was evolved. The gas was passed through lime water which turned milky. It was concluded that

(A) Solid X is sodium hydroxide and the gas Y is CO_2.

(B) Solid X is sodium carbonate and the gas Y is CO_2.

(C) Solid X is sodium acetate and the gas Y is CO_2.

(D) Solid X is sodium hydrogen carbonate and the gas Y is SO_2.

Q.35 The postulates of Bohr's atomic model are given below. Arrange them in the correct sequence.

(A) As long as the electron revolves in a particular orbit, the electron does not lose its energy. Therefore, the orbits are called stationary orbits and the electrons are said to be in stationary energy states.

(B) Electron revolve round the nucleus in specified circular path called orbits or shells.

(C) The energy associated with a certain energy level increase with the increase of distance from the nucleus.

(D) An electron jumps from a lower energy level to a higher energy level by absorbing energy. But when it jumps from a higher to lower energy level, energy is emitted in the form of electromagnetic radiation.

(E) each orbit or shell is associated with definite amount of energy. Hence these are also called energy levels and are designated as K, L, M, N respectively.

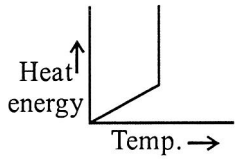
(A) a c d e b (B) b c e a d (C) b e c a d (D) b a d c e

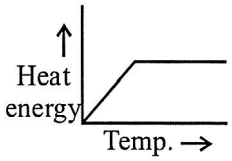
Q.36 Which among the following are isobars?

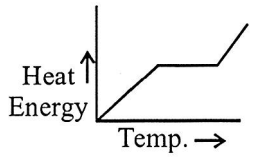
(A) ${}_{b}X^{a}, {}_{b}Y^{a+1}$ (B) ${}_{b}X^{a}, {}_{c}Y^{b}$ (C) ${}_{b}X^{a}, {}_{b+1}Y^{a}$ (D) ${}_{b}X^{a}, {}_{b-1}Y^{a-1}$

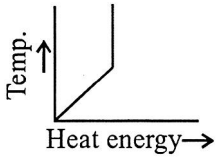
Space for rough work

Q.37 Which of the following is a correct graphical representation of latent heat of fusion of water with respect ot temperature ?

(A) 

(B) 

(C) 

(D) 

Comprehensionv (For Q. No. 38 to Q.No 40)

A new way of expressing the concentration of H^+ ions in solution is pH. pH is defined as the negative logarithm to base 10 of H^+ ion concentration.

$pH = -\log_{10}[H^+]$, where $[H^+]$ represent the concentration of H^+ ions in moles per litre.

Pure water is considered neutral as it dissociates to give equal concentration of H^+ and OH^- ions as follows

$H_2O \rightleftharpoons H^+ + OH^-$.

$[H^+] = [OH^-] = 10^{-7}$ moles per litre at $25^\circ C$.

As per the formula, $pH = -\log_{10}(10^{-7}) = 7$, hence pH of water is 7.

K_w is the ionic product of water which is equla to product of H^+ and OH^- concentration at a particular temperature.

Space for rough work

At $25^{\circ}C$, $K_w = [H^+] \cdot [OH^-] = 10^{-14}$ mol^2 /L^2.

Hence, $pH + pOH = 14$ (only at $25^{\circ}C$).

For an acidic solution $[H^+] > [OH^-]$ which is numerically greater than 10^{-7} mol ion / litre (at $25^{\circ}C$).
Lower the pH value, greater will be the acidic strength of the solution.

For a basic solution $[H^+] < [OH^-]$ which is numerically less that 10^{-7} mol ion/litre. Thus, pH of a base is always greater than 7 at $25^{\circ}C$.
Greater the pH value greater will be the basic strength of the solution.

$(\log 10 = 1; \log 0.1 = -1; \log 100 = 2)$

Q.38 You are provided with four solutions P, Q, R, S with $[H^+]$ values (in mol/litre) as 1.076×10^{-13}, 1.89×10^{-12}, 3.2×10^{-10} and 2.7×10^{-11} respectively. Which solution will be most acidic ?

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

Q.39 At $60^{\circ}C$, if water has $[H^+] = 16^{-5}$ mole/litre, then the solution will be

(A) Acidic (B) Basic (C) Amphoteric (D) Neutral

Q.40 Now if 3.65 gm of HCl is added to 1 litre of water (as mentoned in Q. NO. 16) What will be the pH of resultant solution at 60° C (atomic weight of $Cl = 35.5, H = 1$) ?

(A) 0.01 (B) 0.1 (C) 1 (D) 10

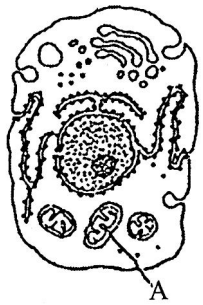
Space for rough work

PART - IV (BIOLOGY)

(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 Select the alternative giving correct identification and function of the organelle 'A' in the diagram.



(A) Endoplasmic reticulum-synthesis of lipids

(B) Mitochondria - produce cellular energy in the from at ATP

(C) Golgi body - packaging of material

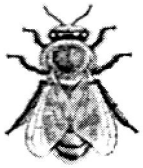
(D) Lysosomes - secrete hydrolytic enzymes

Q.42 Which one of the following organs is NOT associated with the alimentary canal?

(A) Liver (B) Gall bladder (C) Diaphragm (D) Colon

Space for rough work

Q.43 Given is a table descibing the social organization of Honey bees. Which of the following is a correct match of the description of honey bees ?

	Types of Honey Bees	Description
I	 Drone	Female honey bees which prepare honey.
II	 Queen	Fertile female which lays eggs.
III	 Worker	Sterile males which look after the young ones, collect nectar and pollen.

(A) I and II are correct
(B) I and III are corect
(C) Only II is correct
(D) II and III are correct

Space for rough work

Q.44 Compare the movement of substances in xylem and phloem tissues.

Feature	Xylem	Phloem
Material transported	Water and minerals	I
Process of movement	II	Translocation
Name of relevant theory	III, IV	Mass flow theory

Replace I, II, III and IV with the appropriate words.

(A) I - sucrose, II-asent of sap, III - root pressure theory, IV-guttation

(B) I - starch, II - ascent of sap, III - guttation, IV - transpiration pull

(C) I - sucrose, II-ascent of sap, III-root pressure theory, IV - transpiration pull

(D) I - glucose, II - pressure flow hypothesis, II - root pressure theory, IV - adhesion cohesion theory

Q.45 Two test tubes are filled with a solution of bromothymol blud. A student exhales through a straw into each tube, and the bromothymol blue turns yellow. An aquatic green plant is placed in each tube, and the tubes are corked. One tube is placed in the dark, and the other tube is placed in direct sunlight. The yellow solution in the tube in sunlight turns blue, while the one in the dark remains yellow. Which statement best explains why the solution in the tube placed in sunlight returns to a blue colour ?

(A) Oxygen was produced by photosynthesis. (B) Oxygen was removed by respiration.

(C) Carbon dioxide was removed by photosynthesis. (D) Carbon dioxide was produced by respiration.

Space for rough work

Q.46 The anterior pituitary gland facilitates growth of an individual by release of the human growth hormone (HGH) which in turn is regulated by two hormones namely growth hormone releasing hormone (GHRH) and growth hormone inhibiting hormone (GHIH). Imbalance of these hormones could result in gigantism (an individual gains excessive height), dwarfism (a short statured individual) or acromegaly (thickening of limbs, fingers and toes). Interpret the data given below and select the appropriate statement :

Individual	Age group	Hormones
1	2 - 5 yrs.	Excessive GHRH
2	2 - 5 yrs.	Normal GHRH
3	30 - 35 yrs.	Excessive GHRH
4	30 - 35 yrs.	Excessive GHIH
5	2 - 5 yrs.	Excessive GHIH

(A) 1 and 3 will lead to gigantism while 4 and 5 will show dwarfism

(B) 3 will show gigantism, 1 will show acromegaly and 4 and 5 will show dwarfism

(C) 2, 3 and 4 will show normal growth

(D) 1 will show gigantism, 3 will show acromegaly and 5 will show dwarfism

Space for rough work

Q.47 Part of the respiratory system where gaseous exchange takes place is

(A) The parts starting from external nostrils upto terminal bronchioles

(B) Alveoli and their ducts

(C) All bronchi and terminal bronchioles

(D) All bronchioles

Q.48 The principal nitrogenous excretory compound in humans is synthesized

(A) in liver but eliminated mostly through kidneys.

(B) in kidneys but eliminated mostly through liver.

(C) in kidneys as well as eliminated by kidneys.

(D) in liver and also eliminated by the same through bile.

Q.49 Given below are certain feaures.

X. One produces spores, whereas the other produces seeds.

Y. One is photosynthetic, whereas the other is saprophytic.

Z. One contains xylem and phloem, whereas the other does not.

Find the pair of two divisions that can represent X, Y and Z respectively

A. Monocot and dicot

B. Algae and fungi

C. Ferns and mosses

D. Ferns and gymnosperms

E. Gymnosperms and angiosperms

(A) $X = A, Y = B$ and $Z = D$

(B) $X = D, Y = B$ and $Z = C$

(C) $X = E, Y = D$ and $Z = C$

(D) $X = B, Y = E$ and $Z = A$

Space for rough work

Q.50 Which of the following is an effect of HIV on the human body ?

(A) It reduces the number of erythrocytes in the blood

(B) It reduces the number of platelets in the blood

(C) It increases the amount of plasma in the blood

(D) It reduces the number of lymphocytes in the blood

Space for rough work

PART - V (MENTAL ABILITY)

(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 one of the following countries fall in the category of 'coming together federation?

(A) India (B) US (C) Spain (D) Belgium.

Q.52 Among the following which country suffered disintegration due to political fights on the basis of religious and ethnic identities ?

(A) Belgium (B) India (C) yugoslavia (D) Nether lands

Q.53 The congress passed resolution to begin non-cooperation movement in its session at

(A) Nagpur (B) Bombay (C) Lahore (D) Calcutta.

Q.54 Rowlatt act was passed in

(A) 1919 (B) 1917 (C) 1918 (D) 1920

Q.55 If '+' means '×', '−' means '÷','÷' means '+' and '×' means '−', then what will be the value of $16 \div 64 - 4 \times 4 + 3 = ?$

(A) 20 (B) 15.12 (C) 52 (D) None of these

Q.56 Imagine a clock where the hour hand makes only one revolution in 1 day (i.e., 24 hr) whereas the minute hand completes one revolution in one hour. What is the angle between the two hands at 14 : 50 hr as per this clock?

(A) 90° (B) 120° (C) 77.5° (D) 162.5°

Space for rough work

Q.57 How many odd numbers are there in the following number series, which are immediately followed by an odd number ?

7 3 2 9 5 7 4 1 3 6 4 9 5 4 6 5 2 7 2 4 1 6 7 2 1 3

(A) 4 (B) 6 (C) more than 6 (D) 3

Q.58 The minute hand of a clock overtakes the hour hand at intervals of 65 min. How much in a day does the clock gain or lose ?

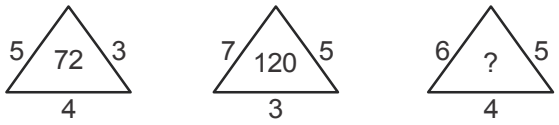
(A) Gains $56\frac{8}{77}$ min (B) Loses $32\frac{8}{11}$ min

(C) Loses $10\frac{10}{143}$ min (D) Gains $10\frac{10}{143}$ min

Q.59 Six students A, B, C, D, E and F are sitting in the field. A and B are from Delhi while the rest are from Bangalore. D and E are tall while others are short. A, C and D are girls while others are boys. Who is the tall girl from Bangalor?

(A) C (B) D (C) E (D) F

Q.60 Find the missing character (?).



(A) 112 (B) 145 (C) 135 (D) 102

Space for rough work

SAMPLE TEST PAPER
ANSWER KEY

1. (D)	2. (A)	3. (B)	4. (C)
5. (A)	6. (A)	7. (B)	8. (A)
9. (A)	10. (A)	11. (A)	12. (B)
13. (B)	14. (C)	15. (A)	16. (C)
17. (B)	18. (C)	19. (D)	20. (A)
21. (B)	22. (D)	23. (A)	24. (D)
25. (B)	26. (C)	27. (C)	28. (C)
29. (B)	30. (C)	31. (B)	32. (D)
33. (D)	34. (B)	35. (C)	36. (C)
37. (A)	38. (C)	39. (A)	40. (C)
41. (B)	42. (C)	43. (C)	44. (C)
45. (C)	46. (D)	47. (B)	48. (A)
49. (B)	50. (D)	51. (B)	52. (C)
53. (A)	54. (A)	55. (A)	56. (C)
57. (B)	58. (D)	59. (B)	60. (C)

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