



# VIBRANT ACADEMY

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### SAMPLE PAPER (MICRO/NANO COURSE)

Time : 2 Hours

Maximum Marks : 216

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

#### INSTRUCTIONS

- (i) The question paper has 7 printed pages excluding Answer Sheet. Please ensure that the copy of the question paper you have received contains all pages.
- (ii) The question paper contains 60 questions. The Question paper consists of **II Sections**.
- (iii) For each question in **Section-I**, you will be awarded **3** marks if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubbles are darkened. **No negative marks** will be awarded in this **Section**.
- (iii) For each question in **Section-II**, you will be awarded **4** marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In case of bubbling of incorrect answer, **minus one (-1) mark** will be awarded.
- (vi) Each question contains four alternatives out of which only **ONE** is correct.
- (v) Indicate the correct answer for each question by filling appropriate bubble in your answer sheet.
- (vi) For rough work, use the space provided at the bottom of each page. No extra sheet will be provided for rough work.
- (vii) Use of Calculator, Log Table, Slide Rule and Mobile is not allowed.
- (viii) The answer of the questions must be marked by shading the circles against the question by dark pencil only. For example if only 'B' choice is correct then,

the correct method for filling the bubble is

A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

the wrong method for filling the bubble are

(a) 

A	B	C	D
<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>

(b) 

A	B	C	D
<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>

(c) 

A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

The answer of the questions in wrong or any other manner will be treated as wrong.

Name of the candidate

Regn. Number

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I have read all the instructions and shall abide by them.

.....  
Signature of the Candidate

I have verified all the information filled in by the candidate.

.....  
Signature of the invigilator

**SECTION-I**  
**Single Correct Choice Type**

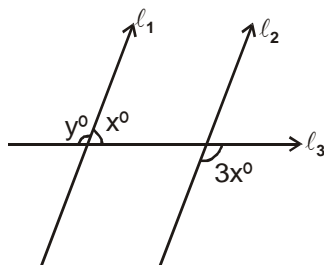
This part contains 24 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

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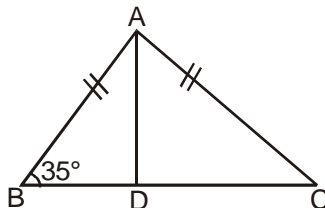
1. Which one of the following is not a pure substance ?  
(A) Ice (B) Iron (C) Brick (D) Calcium oxide
2. Given that  $\tan \theta = \frac{1}{\sqrt{3}}$ , the value of  $\frac{\operatorname{cosec}^2 \theta - \sec^2 \theta}{\operatorname{cosec}^2 \theta + \sec^2 \theta}$  is  
(A) -1 (B) 1 (C)  $\frac{1}{2}$  (D)  $-\frac{1}{2}$
3. If we want to see our full image then the minimum size of the plane mirror :  
(A) Should be twice of our height. (B) Should be of our height.  
(C) Should be half of our height. (D) Depends upon our distance from mirror.
4. The value of k for which the pair of linear equation  $4x + 6y - 1 = 0$  and  $2x + ky - 7 = 0$  represent parallel lines is  
(A)  $k = 3$  (B)  $k = 2$  (C)  $k = 4$  (D)  $k = -2$
5. The most important safety method used for protecting home appliances from short circuiting or overloading is :  
(A) Earthing (B) Use of fuse (C) Use of stabilizers (D) Use of electric meter
6. The radii of two cylinder are in the ratio 3 : 5. If their heights are in the ratio 2 : 3, then the ratio of their curved surface areas is  
(A) 2 : 5 (B) 5 : 2 (C) 2 : 3 (D) 3 : 5
7. If  $x = \frac{2}{3 + \sqrt{7}}$ , then  $(x - 3)^2$  is  
(A) 1 (B) 3 (C) 6 (D) 7
8. How many atoms are present in  $\text{H}_2\text{S}$  molecule ?  
(A) 1 (B) 2 (C) 3 (D) 4
9. The value of m for which  $\left[ \left\{ \left( \frac{1}{7^2} \right)^{-2} \right\}^{-\frac{1}{3}} \right]^{\frac{1}{4}} = 7^m$  is  
(A)  $-\frac{1}{3}$  (B)  $\frac{1}{4}$  (C) -3 (D) 2
10. Write the distribution of electrons in sodium atom ?  
(A) 2, 8, 1 (B) 2, 8, 2 (C) 2, 8, 3 (D) 2, 8, 4
11. The value of  $\frac{(2.3)^3 - 0.027}{(2.3)^2 + 0.69 + 0.09}$  is  
(A) 2 (B) 3 (C) 2.327 (D) 2.273
12. You have 2 solutions, A & B. The pH of solution A is 6 that of B is 8. Which solution is more acidic ?  
(A) A (B) B (C) Both equally acidic (D) Cannot be determined

13. The value of  $k$  for which  $x - 1$  is a factor of  $4x^3 + 3x^2 - 4x + k$  is  
 (A) 3 (B) 1 (C) -2 (D) -3

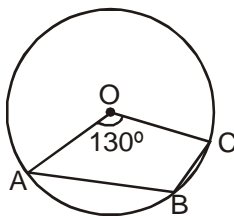
14. If  $l_1 \parallel l_2$  what is the value of  $y$  ?



- (A) 100 (B) 120 (C) 135 (D) 150
15. What is the common name of the compound  $\text{CaOCl}_2$  ?  
 (A) Caustic soda (B) Washing soda (C) Bleaching powder (D) Plaster of Paris
16. Butanone is a four carbon compound with the functional group ?  
 (A) Carboxylic acid (B) Aldehyde (C) Ketone (D) Alcohol
17. ABC is an isosceles triangle such that  $AB = AC$  and AD is the median to base BC. Then  $\angle BAD$



- (A)  $55^\circ$  (B)  $70^\circ$  (C)  $35^\circ$  (D)  $110^\circ$
18. A body is thrown vertically upward with the velocity  $u$ , the greatest height  $h$  to which it will rise is :  
 (A)  $u/g$  (B)  $u^2/2g$  (C)  $u^2/g$  (D)  $u/2g$
19. In a quadrilateral ABCD,  $\angle A + \angle C$  is 2 times  $\angle B + \angle D$ , if  $\angle A = 40^\circ$  then  $\angle C =$   
 (A)  $60^\circ$  (B)  $80^\circ$  (C)  $120^\circ$  (D) None of these
20. The combined effect of mass and velocity is taken into account by a physical quantity called :  
 (A) Torque (B) Momentum (C) Moment of force (D) Moment of inertia
21. In figure O is the centre of the circle such that  $\angle AOC = 130^\circ$  then  $\angle ABC =$



- (A)  $130^\circ$  (B)  $115^\circ$  (C)  $65^\circ$  (D)  $165^\circ$
22. When a body is immersed in a liquid, it undergoes an apparent :  
 (A) Loss in its mass (B) Loss in its volume (C) Loss in its weight (D) No loss in any respect
23. Two cylindrical jars have their diameters in the ratio 3 : 1 but height 1 : 3 then the ratio of their volume is  
 (A) 1 : 4 (B) 1 : 3 (C) 3 : 1 (D) 2 : 5
24. A flying aeroplane possesses :  
 (A) Only PE (B) Only KE (C) Both PE + KE (D) No energy

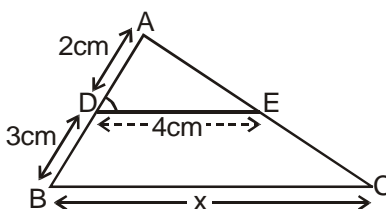
## SECTION-II

### Single Correct Choice Type

This part contains 24 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

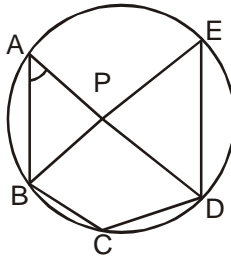
25. A lens is placed between a lamp and a screen which are 18 cm apart, so that the image on the screen is three times as large as the lamp. The distance between the lamp and the lens is  
 (A) 3.2 cm                      (B) 3.8 cm                      (C) 4.2 cm                      (D) 4.5 cm.
26. Two coins are tossed simultaneously. The probability of getting atmost one head is  
 (A)  $\frac{1}{3}$                               (B)  $\frac{3}{4}$                               (C)  $\frac{1}{2}$                               (D)  $\frac{1}{4}$
27. A ball is thrown straight up in the air. At its highest point  
 (A) the velocity and acceleration are zero.  
 (B) the velocity is non zero but the acceleration is zero.  
 (C) the acceleration is non zero but the velocity is zero.  
 (D) the velocity and acceleration are both non zero.

28. In figure, if  $DE \parallel BC$ , then x equals

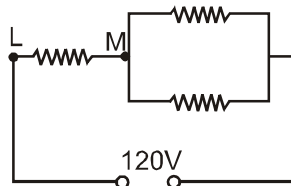


- (A) 6 cm                      (B) 8 cm                      (C) 10 cm                      (D) 12.5
29. A spring balance carrying a load of 1 kg is dropped freely from a certain height. The reading of the spring balance during free fall would be  
 (A) 50 Kg                      (B) 0 Kg                      (C) 30 Kg                      (D) 22 Kg
30. If TP and TQ are two tangents to a circle with centre O so that  $\angle POQ = 110^\circ$ , then,  $\angle PTQ$  is equal to  
 (A)  $60^\circ$                       (B)  $70^\circ$                       (C)  $80^\circ$                       (D)  $90^\circ$
31.  $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$   
 The above reaction is an example of a  
 (A) Combination reaction                      (B) Double displacement reaction  
 (C) Decomposition reaction                      (D) Displacement reaction
32. If the circumference of a circle is equal to the perimeter of a square then the ratio of their areas is :  
 (A) 22 : 7                      (B) 14 : 11                      (C) 7 : 22                      (D) 7 : 11
33. A solution turns red litmus blue, its pH is likely to be :  
 (A) 1                      (B) 4                      (C) 5                      (D) 10
34. If  $n = 67$  then find the unit digit of  $[3^n + 2^n]$ .  
 (A) 1                      (B) 10                      (C) 5                      (D) None

35. Ethane with the molecular formula  $C_2H_6$  has.  
 (A) 10 covalent bonds (B) 7 covalent bonds  
 (C) 8 covalent bonds (D) 9 covalent bonds
36. If the quadratic equation  $(a^2 - b^2)x^2 + (b^2 - c^2)x + (c^2 - a^2) = 0$  has equal roots, then which of the following is true?  
 (A)  $b^2 + c^2 = a^2$  (B)  $b^2 + c^2 = 2a^2$  (C)  $b^2 - c^2 = 2a^2$  (D)  $a^2 = b^2 + 2c^2$
37. Two bodies A and B having masses in the ratio of 3 : 1 possess the same kinetic energy. The ratio of linear momentum of B to A is  
 (A) 1 : 3 (B) 3 : 1 (C)  $1 : \sqrt{3}$  (D)  $\sqrt{3} : 1$
38. In the following figure (not to scale),  $\angle ADC = 60^\circ$ ,  $\angle BAD = 80^\circ$  and  $\angle EBC = 2\angle PDE$ . Find  $\angle APE$



- (A)  $60^\circ$  (B)  $80^\circ$  (C)  $120^\circ$  (D)  $140^\circ$
39. The current from A to B is increasing in magnitude. What is the direction of induced current, if any, in the loop shown in figure ?
- 
- (A) No current is induced (B) clockwise current  
 (C) anti clockwise current (D) Alternating current
40. The sides of a quadrilateral are all positive integers and three of them are 5, 10, 20. How many possible values are there for the fourth side ?  
 (A) 29 (B) 31 (C) 32 (D) 34
41. Three identical resistances are connected to a constant-voltage of 120 V as shown in Fig. What is potential difference across LM.



- (A) 80V (B) 110V (C)  $(120/3)V$  (D) None

42. If  $\sqrt{19 - 4\sqrt{x}} = \sqrt{12} - \sqrt{7}$ , then  $x =$  \_\_\_\_\_  
 (A) 84 (B) 28 (C) 21 (D) 14
43. Which element has 2 shells, both of which are completely filled with electrons ?  
 (A) Helium (B) Neon (C) Argon (D) Radon
44. A rationalizing factor of  $\sqrt[3]{16} + \sqrt[3]{4} + 1$  is  
 (A)  $(4^{1/3} + 1)$  (B)  $4^{1/3} - 1$  (C)  $2^{1/3} + 1$  (D)  $2^{1/3} - 1$
45. The modern atomic weight scale is based on :  
 (A)  $C^{12}$  (B)  $O^{16}$  (C)  $H^1$  (D)  $C^{13}$
46. If  $\tan P + \cot P = 2$ , then the value of  $\tan^n P + \cot^n P$  is \_\_\_\_\_.  
 (A) 2 (B)  $2^n$  (C)  $2^{n-1}$  (D)  $2^{n+1}$
47. Calculate number of neutrons present in  $12 \times 10^{25}$  atoms of oxygen ( ${}_8O^{17}$ ). (Given  $N_A = 6 \times 10^{23}$  atoms)  
 (A) 1800 (B) 1600 (C)  $1800 N_A$  (D)  $3200 N_A$
48. Two circles are concentric. A chord of the larger circle is tangent to the smaller. If the area of the annulus is A, express the length of the chord in terms of A.  
 (A)  $\sqrt{\frac{A}{\pi}}$  (B)  $2\sqrt{\frac{A}{\pi}}$  (C)  $\sqrt{\frac{\pi}{A}}$  (D)  $2\sqrt{\frac{\pi}{A}}$

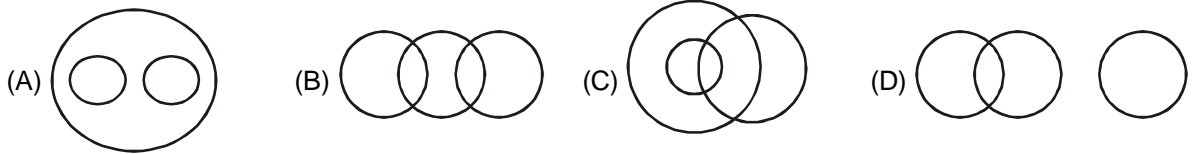
**MENTAL ABILITY**  
**Single Correct Choice Type**

This part contains 12 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

49. Pointing to a woman, Naman said, 'She is the daughter of the only child of my grandmother.' How is the woman related to Naman ?

- (A) Sister                      (B) Niece                      (C) Cousin                      (D) Mother

50. Which of the following diagrams correctly represents Elephants, Wolves, Animals

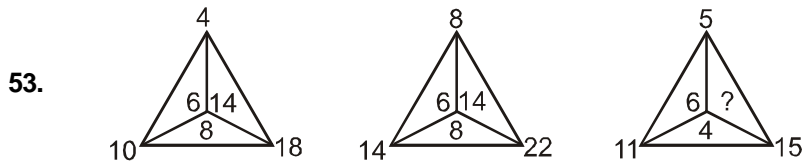


51. In a row of students, Deepak is seventh from the left and Madhu is twelfth from the right. If they interchange their positions, Deepak becomes twenty-second from the left. How many students are there in the row ?

- (A) 19                      (B) 31                      (C) 35                      (D) None of these

52. If  $32 \times 41 = 15$ ;  $51 \times 34 = 47$ ;  $41 \times 52 = 37$ , then  $87 \times 53 = ?$

- (A) 68                      (B) 64                      (C) 85                      (D) 18



53. (A) 6                      (B) 8                      (C) 10                      (D) 14

54. AZ, CX, FU,.....

- (A) IR                      (B) IV                      (C) JQ                      (D) KP

55. JE, LH, OL, SQ, ....

- (A) WV                      (B) WX                      (C) VW                      (D) XW

56. Find the next term

10, 12, 16, 24, 40, ....

- (A) 60                      (B) 56                      (C) 70                      (D) 72

57. A clock is so placed that at 12 noon its minute hand points towards North-east. In which direction does its hour hand point at 1 : 30 p.m.

- (A) North                      (B) South                      (C) East                      (D) West

58. If in a certain language, CALCUTTA is coded as GEPGYXXE which word would be coded as FSQFCE ?

- (A) BOMBYA                      (B) BOMBAY                      (C) BOMYAB                      (D) BOBAYM

59.  $12 : 169 :: 11 : ?$

- (A) 154                      (B) 49                      (C) 111                      (D) 144

60. Choose the odd numeral pair in each of the following options :

- (A) 81 – 63                      (B) 24 – 48                      (C) 21 – 15                      (D) 13 – 39