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SAMPLE TEST PAPER

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SUBJECT : PHYSICS

1. If time (t), velocity (v), and angular momentum (ℓ) are taken as the fundamental units. Then the dimension of mass (m) in terms of t, v and ℓ is ($\ell = mvr$) :

(1) $[t^{-1}\ v^{1}\ \ell^{-2}]$ (2) $[t^{1}\ v^{2}\ \ell^{-1}]$

(3) $[t^{-2}\ v^{-1}\ \ell^{1}]$ (4) $[t^{-1}\ v^{-2}\ \ell^{1}]$

2. Suppose the kinetic energy of a body oscillating with amplitude A and at a distance x is given by $K = \frac{bx}{x^2 + A^2}$. The dimensions of b are the same as that of

(1) $\frac{\text{work}}{\text{time}}$

(2) work $\times$ dis tan ce

(3) $\frac{\text{work}}{\text{dis tan ce}}$

(4) work $\times$ time

3. The time period T of a simple pendulum is given by $T = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum and g is the acceleration due to gravity. The value of L is measured to be 100.0 cm using a metre scale of least count 0.1 cm. The time for 20 oscillations is measured to be 40.0s using a stop-watch of least count 0.1s. The calculated value of g is

(1) $(9.87 \pm 0.06)\ ms^{-2}$

(2) $(9.9 \pm 0.1)\ ms^{-2}$

(3) $(9.86 \pm 0.05)\ ms^{-2}$

(4) $(9.872 \pm 0.059)\ ms^{-2}$

4. The mass of a ball is 1.76 kg. The mass of 25 such balls is

(1) 0.44×10^{3}kg (2) 44.0 kg

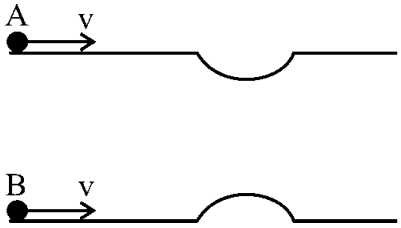
(3) 44 kg (4) 44.00 kg

5. The current voltage relation of diode is given by $I = (e^{1000V/T} - 1)$ mA, where the applied voltage V is in volts and the temperature T is in Kelvin. If a student makes an error measuring ± 0.01V while measuring the current of 5mA at 300 K, what will be error in the value of current in mA ?

(1) 0.5 mA (2) 0.05 mA

(3) 0.2 mA (4) 0.02 mA

6. Two marbles A & B roll along two horizontal track with same initial speed. A moves on the track which has a dip and B moves on the track which has a bump of the same shape. Which marble wins? (Assume no marble leaves contact at any point.)



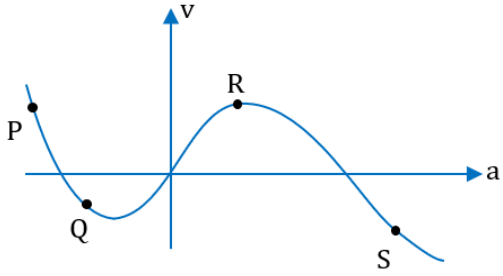
(1) B

(2) A

(3) Both will reach at the same time

(4) None of these

7. Acceleration-velocity graph of a moving particle is shown in figure. The particle is



(1) speeding up at P

(2) speeding up at Q

(3) speeding up at S

(4) speeding down at R

8. A particle is projected from the ground with velocity u at angle θ with horizontal. The horizontal range, maximum height and time of flight are R, H and T respectively. They are given by $R = \frac{u^2 \sin 2\theta}{g}$; $H = \frac{u^2 \sin^2 \theta}{2g}$ and $T = \frac{2u \sin \theta}{g}$. Now keeping u fixed, θ is varied from 30° to 60°, then :-

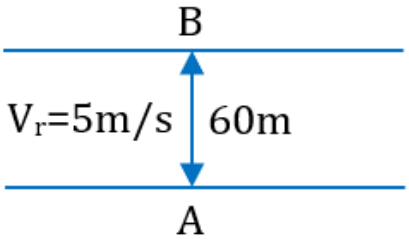
(1) R will first increase then decrease, H will increase and T will decrease.

(2) R will first increase then decrease while H and T both will increase.

(3) R will decrease while H and T both will increase.

(4) R will increase while H and T both will also increase.

9. A man is crossing a river flowing with velocity of 5 *m/s*. He reaches a point directly across the river at a distance of 60 *m* in 5 sec. His velocity in still water should be :-



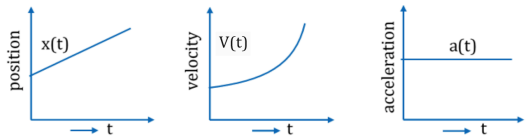
(1) 12 *m/s*

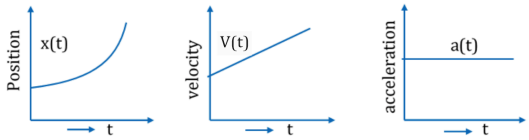
(2) 13 *m/s*

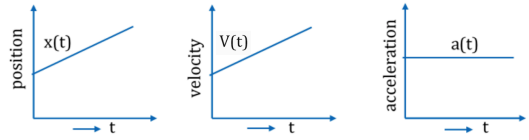
(3) 5 *m/s*

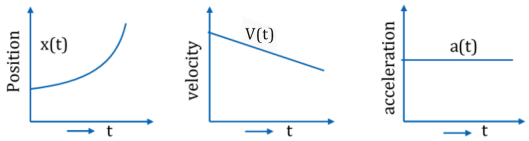
(4) 10 *m/s*

10. The position, velocity and acceleration of a particle moving with a constant acceleration can be represented by :

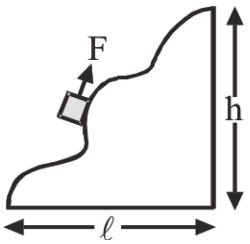
(1) 

(2) 

(3) 

(4) 

11. A body of mass m was slowly hauled up the hill by a force F which at each point was directed along a tangent to the path. The work done by this force, if the height of the hill is h, the length of its base is ℓ and the coefficient of friction is μ, is :



(1) $mgh - \mu mg\ell$

(2) $mgh + \mu mg\ell$

(3) $mgh + \mu mg\sqrt{\ell^2 + b^2}$

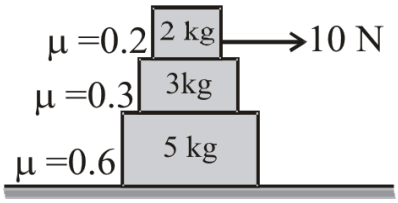
(4) Can't determined

12. The tension in the spring is :-

(1) Zero (2) 2.5 N

(3) 5 N (4) 10 N

13.



In the above figure acceleration of 2 kg block will be -

(1) 3 m/sec^2 (2) 2 m/sec^2

(3) 1 m/sec^2 (4) None

14. The PE of a 2 kg particle, free to move along x-axis is given by V(x) = $\left(\frac{x^3}{3} - \frac{x^2}{2}\right)$ J. The total mechanical energy of the particle is 4 J. Maximum speed (in ms^{-1}) is :-

(1) $\frac{1}{\sqrt{2}}$ (2) $\sqrt{2}$

(3) $\frac{3}{\sqrt{2}}$ (4) $\frac{5}{\sqrt{6}}$

15. A body of mass 3 kg is under a force, which causes a displacement in it given by S = $\frac{t^3}{3}$(in m). Find the work done by the force in first 2 seconds

(1) 2 J (2) 3.8 J

(3) 5.2 J (4) 24 J

16. A particle is moving along a straight line according to relation $t^2 - 25vt + 2500 = 0$; where v is the speed in m/s and t is time in seconds. What can be the value of v?

(1) All values less than 16 ms^{-1}

(2) All values more than or equal to 4 ms^{-1}

(3) All positive values are possible

(4) No value of v can satisfy this relation

17. Consider following graphs :-

(i) Graph of y versus x for the equation $x^2 - y = 7$.

(ii) Graph of y versus $\sqrt{x}$ for the equation $y = 3\sqrt{x}$

(iii) Graph of $\sqrt{y}$ versus x for the equation $y = 2x^2$.

Which of the graph yield a straight line ?

(1) (i) and (ii)

(2) (i) and (iii)

(3) (ii) and (iii)

(4) (i), (ii) and (iii)

18. Value of tan(106°) will be :-

(1) $\frac{24}{7}$

(2) $-\frac{7}{24}$

(3) $-\frac{24}{7}$

(4) $-\frac{8}{3}$

19. Find the value of $\sqrt{0.999}$:-

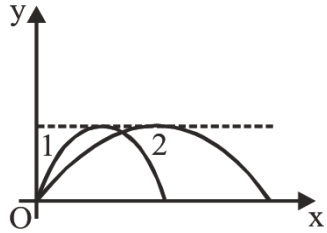
(1) 0.333 (2) 0.995

(3) 0.9995 (4) 0.9999

20. In the diagrams of two projectiles 1 and 2 as shown in the figure :-

[where v_{0_1} = projection speed of 1

v_{0_2} = projection speed of 2]



(1) $T_1 > T_2$ and $v_{0_1} < v_{0_2}$

(2) $T_1 = T_2$ and $v_{0_1} < v_{0_2}$

(3) $T_1 = T_2$ and $v_{0_1} > v_{0_2}$

(4) $T_1 < T_2$ and $v_{0_1} < v_{0_2}$

21. For sodium atom, the number of electrons with m = 0 will be :-

(1) 2 (2) 7 (3) 9 (4) 8

22. The energy of the second bohr orbit in the hydrogen atom is −3.41 eV. The energy of the second Bohr orbit of He^+ ion would be :−

(1) −0.85 eV (2) −13.64 eV

(3) −1.70 eV (4) −6.82 eV

23. If the potential energy (PE) of hydrogen electron is −3.02eV then in which of the following excited level electron present.

(1) 1st (2) 2^{nd}

(3) 3^{rd} (4) 4^{th}

24. Wave number of a spectral line for a given transition is x cm^{-1} for He^+, then its value for Be^{3+} for the same transition is :-

(1) 4x cm^{-1} (2) x cm^{-1}

(3) x/4 cm^{-1} (4) 2x cm^{-1}

25. For the reaction : $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$, the forward reaction at constant temperature is favoured by :-

(a) Introducing inert gas at constant pressure

(b) Introducing inert gas at constant volume

(c) Introducing PCl_5 at constant volume

(d) Introducing Cl_2 at constant volume

(1) a, b (2) a, c

(3) b, c (4) a, d

26. 2 mole of PCl_5 were heated in a closed vessel of 2 litre capacity. At equlibrium, 40% of PCl_5 is dissociated in PCl_3 and Cl_2. The value of equilibrium constant is :-

(1) 0.266 (2) 0.53

(3) 2.66 (4) 5.3

27. Find out the volume of air required to burn 16 L of C_2H_2 gas if the air is having 20% oxygen by volume:-

(1) 200 L (2) 40 L

(3) 150 L (4) 80 L

28. Number of electrons in 1.8 mL of H_2O is :-

(1) 6.02×10^{23} (2) 3.01×10^{23}

(3) 0.6022×10^{23} (4) 60.22×10^{23}

29. Under identical conditions, how many mL of 1M-KOH and 2M-H_2SO_4 solution are required to produce a resulting volume of 100 mL with the highest rise in temperature ?

(1) 80, 20 (2) 20, 80

(3) 60, 40 (4) 50, 50

30. Which of the following reactions defines ΔH_f° ?

(1) $C_{(diamond)} + O_2(g) \rightarrow CO_2(g)$

(2) $\frac{1}{2}H_2(g) + \frac{1}{2}F_2(g) \rightarrow HF(\ell)$

(3) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

(4) $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$

31. $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(\ell)}$; $\Delta H = -100$ kJ/mol

Then calculate enthalpy for the reaction :-

$2H_2O_{(\ell)} \longrightarrow 2H_{2(g)} + O_{2(g)}$

(1) −100 kJ (2) −200 kJ

(3) 200 kJ (4) 100 kJ

32. The entropy change in the isothermal reversible expansion of 2 moles of an ideal gas from 10 L to 100 L at 300 K is:

(1) 42.3 JK^{-1} (2) 35.8 JK^{-1}

(3) 38.3 JK^{-1} (4) 32.3 JK^{-1}

33. Out of the following which is not the set of intensive properties?

(1) boiling point, pH, molarity

(2) volume, area, length

(3) freezing point, temperature, emf

(4) refractive index, molality, density

34. An imaginary process $X \longrightarrow 2Y$ takes place in three step :-

$X \longrightarrow 2A$; $\Delta H = x$

$A \longrightarrow B$; $\Delta H = y$

$B \longrightarrow Y$; $\Delta H = z$

Then Heat of reaction $X \longrightarrow 2Y$ will be :

(1) $x + y + z$

(2) $x + 2y + z$

(3) $x + 2y + 2z$

(4) $x + y + 2z$

35. 2 mole of an ideal gas at 27°C expands isothermally and reversibly from a volume of 4 litre to 40 litre. The work done (in kJ) by the gas is :

(1) $w = -28.72$ kJ

(2) $w = -11.488$ kJ

(3) $w = -5.736$ kJ

(4) $w = -4.988$ kJ

36. Identify correct match among following :-

(1) ClF_3 ; planar and nonpolar

(2) PCl_5 ; non planar and polar

(3) BF_3 ; Planar and polar

(4) SF_6 ; Non planar and nonpolar

37. The correct order of solubility is

(1) LiOH > NaOH > KOH > RbOH > CsOH

(2) $BeCO_3 < MgCO_3 < CaCO_3 < SrCO_3 < BaCO_3$

(3) $NaCl > MgCl_2 > AlCl_3$

(4) LiF > NaF > KF > RbF > CsF

38. Which of the following is paramagnetic?

(1) O_2

(2) B_2

(3) NO

(4) All

39. Which of the following is not correctly matched?

(1) $XeF_2 \longrightarrow sp^3d$

(2) $PCl_5 \longrightarrow sp^3d^2$

(3) $NH_3 \longrightarrow sp^3$

(4) $ClF_3 \longrightarrow sp^3d$

40. Among O, O^+, O^{+2} and O^{-2}, the species having largest and smallest value of ΔH_{eg} are respectively:

(1) O^+ and O

(2) O^{+2} and O^{-2}

(3) O and O^{-2}

(4) O and O^{+2}

41. Solution set of $\frac{(x+1)^{2015}(x)^{2016}(x+2)^{2017}}{(x+3)^{2018}(x+4)^{2019}} \geqslant 0$ is given by

(1) $(-\infty, -4) \cup [-2, -1]$

(2) $(-\infty, -4) \cup (-2, -1)$

(3) $(-4, -3) \cup (-3, -2] \cup [-1, \infty]$

(4) $(-4, -3) \cup (-3, -2) \cup (-1, \infty)$

42. If $2^{(\log_2 3)^x} = 3^{(\log_3 2)^x}$ then the value of x is equal to

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$

(3) $\frac{1}{3}$ (4) $\frac{1}{6}$

43. Let $P(x) = x^7 - 3x^5 + x^3 - 7x^2 + 5$ and $q(x) = x - 2$. The remainder if p(x) is divided by q(x) is

(1) $\frac{5}{2}$ (2) 5 (3) 17 (4) -3

44. Two newspapers A and B are published in a city. It is known that 25% of the city populations reads A and 20% reads B while 8% reads both A and B. Further, 30% of those who read A but not B look into advertisements and 40% of those who read B but not A also look into advertisements, while 50% of those who read both A and B look into advertisements. Then the percentage of the population who look into advertisement is: -

(1) 12.8 (2) 13.5

(3) 13.9 (4) 13

45. Let α and β be two real roots of the equation $(k+1)\tan^2 x - \sqrt{2}\lambda \tan x = (1-k)$, where $(k \neq -1)$ and λ are real numbers.
If $\tan^2(\alpha + \beta) = 50$, then a value of λ is ;

(1) 5 (2) 10 (3) $5\sqrt{2}$ (4) $10\sqrt{2}$

46. Find the value of the expression
$\frac{1}{\cos 0^\circ . \cos 1^\circ} + \frac{1}{\cos 1^\circ . \cos 2^\circ} + \frac{1}{\cos 2^\circ . \cos 3^\circ} + \ldots\ldots + \frac{1}{\cos 44^\circ . \cos 45^\circ}$

(1) $\sin 89^\circ$ (2) $\cos 91^\circ$

(3) $\sec 89^\circ$ (4) $\sin 88^\circ$

47. The sum of all the 3 digit numbers which are divisible by 1,2, 3,4 and 5 is

(1) 5050 (2) 5150

(3) 8000 (4) 8100

48. If $\log_{10} x + \log_{10} y \geq 2$, then the samllest possible value of x + y is -

(1) 10 (2) 40

(3) 30 (4) 20

49. If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then k lies in the interval-

(1) [4,5] (2) $(-\infty, 4)$

(3) $(6, \infty)$ (4) (5,6)

50. If α, β, γ are three numbers such that $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma} = \frac{1}{2}$, $\alpha + \beta + \gamma = 2$, $\frac{1}{\alpha^2} + \frac{1}{\beta^2} + \frac{1}{\gamma^2} = \frac{9}{4}$ then $\alpha - \beta$ is (where $\alpha > \beta > \gamma$) :

(1) 2 (2) 3 (3) 0 (4) 1

51. The number of rational term in expansion of $\left(5^{\frac{1}{2}} + 7^{\frac{1}{6}}\right)^{65}$ is :-

(1) 10

(2) 11

(3) 12

(4) 0

52. If 7^{th} term from beginning in the binomial expansion $\left(\frac{3}{(84)^{1/3}} + \sqrt{3}\ln x\right)^9$, $x > 0$ is equal to 729, then possible value of x is -

(1) e^2

(2) e

(3) e/2

(4) 2e

53. $^{80}C_{40}$ is not divisible by -

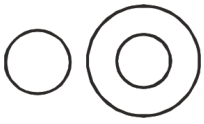
(1) 7

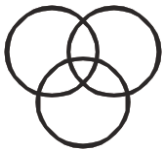
(2) 23

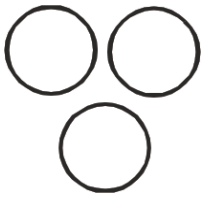
(3) 11

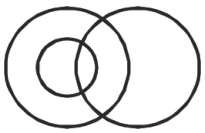
(4) 29

54. Which of the following Venn-diagrams best represents the sets of females, mothers and doctors?

(1) 

(2) 

(3) 

(4) 

55. If the 10^{th}, 15^{th}, 25^{th} term of an arithmetic progression are in geometric progression then the common ratio of geometric progression is (common difference of arithmetic progression $\neq$ 0)

(1) 2 (2) 3 (3) 4 (4) 5

56. The sum of the series $1 - 4 + 7 - 10 + 13 - 16 + ...$ upto 101 terms, is

(1) 100 (2) 149

(3) 150 (4) 151

57. If the sum $\frac{3}{1^2} + \frac{5}{1^2+2^2} + \frac{7}{1^2+2^2+3^2} + ... +$ upto 20 terms is equal to $\frac{k}{21}$, then k is equal to :

(1) 240 (2) 120

(3) 180 (4) 60

58. Number of non-negative integral values of x satisfying the inequality $\frac{2}{x^2-x+1} - \frac{1}{x+1} - \frac{2x-1}{x^3+1} \geq 0$ is

(1) 0 (2) 1

(3) 2 (4) 3

59. Complete set of values of k for which the equation $4^x - (k+2)2^x + 2k = 0$, has exactly one positive root, is

(1) $(-\infty, 1)$

(2) $(-\infty, 1]$

(3) $\left(\frac{1}{2}, \infty\right)$

(4) $(0, \infty)$

60. The sum of first n terms of series, $1\,|\underline{1} + 2\,|\underline{2} + 3\,|\underline{3} + 4\,|\underline{4} + \ldots \infty$
($|\underline{x}$ is factorial of x)

(1) $|\underline{n+1} - 1$

(2) $|\underline{n} - 1$

(3) $|\underline{n-1} - 1$

(4) $|\underline{n+1} + 1$

SUBJECT : MENTAL ABILITY

61. If A+B means A is the father of B.
A-B means A is the mother of B.
A×B means A is the brother of B.
A÷B means A is the sister of B.
Then on this basis answer the following question:
Which of the following option shows that P is the grandmother of S?

(1) P+Q×R÷S

(2) P-Q+R÷S

(3) P×Q+R÷S

(4) P+Q+R÷S

62. If 13 September 2003 is Saturday, then what day of the week will it be on 14 February 2005?

(1) Friday

(2) Wednesday

(3) Monday

(4) Saturday

63. In a Code language BACHELOR is written as SNMDIBBA. How will be written COHESION in that language?

(1) ONIFTJBP

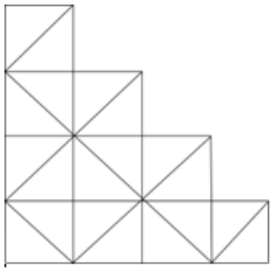
(2) ONJRFGPB

(3) NPHTDIND

(4) BPJTFINO

(5) Question not attempted

64. How many squares in the given figure.



(1) 10

(2) 11

(3) 12

(4) 14

(5) Question not attempted

65. Ram and Mohan are standing in a corridor and talking to each other just before sunset. If Mohan's shadow is falling just left to Ram, then in which direction is Ram facing?

(1) East

(2) West

(3) South

(4) North

66. Find out the right term which replace the question mark (?)

256	289	484
6	5	6
96	85	?

(1) 124

(2) 132

(3) 120

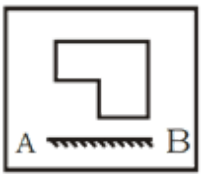
(4) 125

67. 2, 4, 16, 52, 132, 282, ?

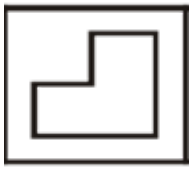
(1) 512 (2) 534

(3) 572 (4) 527

68. If the mirror is placed on the line AB, then which of the answer figures is the right image of the given question figure?



(1) 

(2) 

(3) 

(4) 

(5) Question not attempted

69. Three of the following words are alike in some way or the other and hence form a group. Which word does not belong to that group?

(1) (5-125-155) (2) (6-216-206)

(3) (4-64-54) (4) (7-343-331)

70. 19 persons are standing in a queue. Manish is 7^{th} from back. Rinku is exactly in the middle of Manish and Seema. Seema and Rinku have three persons between them. What is the position of Seema from the front ?

(1) 5^{th}

(2) 4^{th}

(3) 6^{th}

(4) 7^{th}

(5) Question not attempted

71. Six friends B, D, F, H, J and L are sitting around a circular table facing the centre, but not necessarily in the same order. B is to the immediate right of L. D is second to the left of J. F is second to the left of H. L is second to the right of H. Who sits third to the left of F?

(1) D (2) B (3) J (4) L

72. Select the term that will come next in the following series.

57, 62, 31, 36, 18, ?

(1) 34

(2) 23

(3) 19

(4) 36

(5) Question not attempted

73. Select that set of letters which when sequentially placed at the gaps in the given letter series will complete the series?

cd_ab_cd_abb_dda_b

(1) bbcdb (2) dbdcb (3) dbcbc (4) cbdab

74. **Statements:**

I. All rains are water.

II. No water is blue.

Conclusions:

I. Some water are rains.

II. Some blue are water.

(1) Only I follows

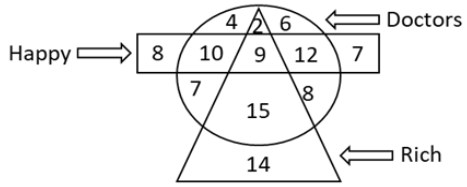
(2) Only II follows

(3) Both follows

(4) None follows

(5) Question not attempted

75. In the following diagram, triangle represents 'rich', circle represents 'doctor' and rectangle represents 'happy people'. The numbers given in different sections indicate the number of people.



How many rich doctors are not happy?

(1) 1

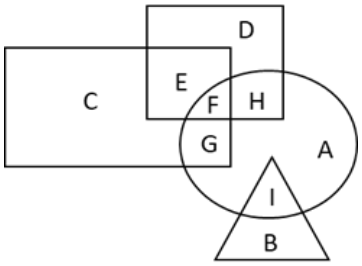
(2) 26

(3) 9

(4) 17

(5) Question not attempted

76. In the following figure, rectangle represents artists, triangle represents accountant, circle represents social workers and square represents father. Which set of letters represents those social workers who are not father?



(1) GAI

(2) DEB

(3) IGF

(4) GFH

(5) Question not attempted

77. Pointing to a man in a photograph a woman says. He is the father-in-law of the wife of only paternal grandson of my own father-in-law. How is woman related to man?

(1) Son

(2) Wife

(3) Cousin

(4) Nephew

(5) Question not attempted

78. If LIBERATE is written as 56423172 in a 56423172 code language, how will TRIBAL be written in that language?

(1) 736415

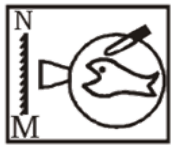
(2) 673451

(3) 476315

(4) 743615

(5) Question not attempted

79. Question Figure:-



(1) 

(2) 

(3) 

(4) 

80. Three of the following four words are like in a certain way and one word is different, identify the different word.

(1) Diabetes

(2) Disappointment

(3) Anemia

(4) High blood pressure

Space for Rough Work