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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 × distance

(3) $\frac{\text{work}}{\text{distance}}$ (4) work × 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

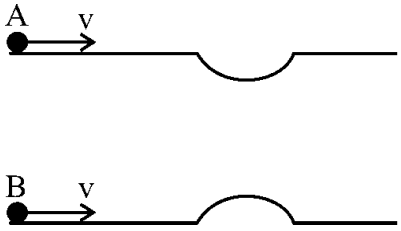
(3) 44 kg (4) 44.00 kg

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

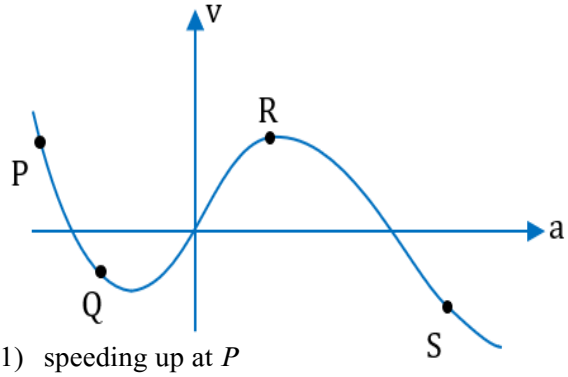
6. Two marbles A & B roll along two horizontal track with same initial speed. A moves on the track which has a dip and B moves on the track which has a bump of the same shape. Which marble wins? (Assume no marble leaves contact at any point.)



(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 :-

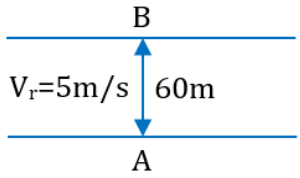
(1) R will first increase then decrease, H will increase and T will decrease.

(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.

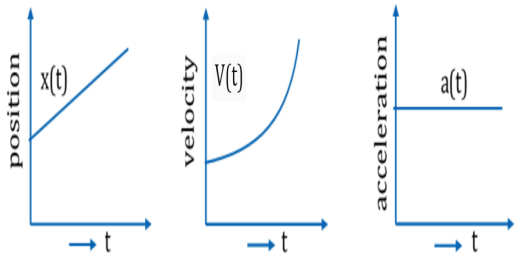
9. A man is crossing a river flowing with velocity of 5 *m/s*. He reaches a point directly across the river at a distance of 60 *m* in 5 sec. His velocity in still water should be :-

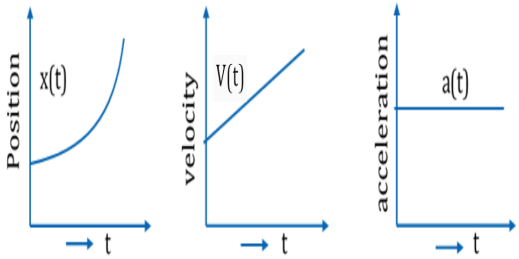


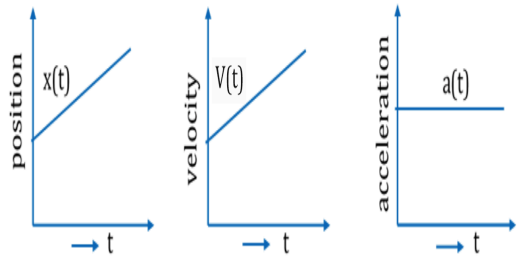
(1) 12 *m/s* (2) 13 *m/s*

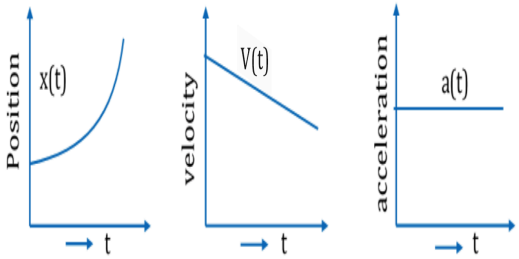
(3) 5 *m/s* (4) 10 *m/s*

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

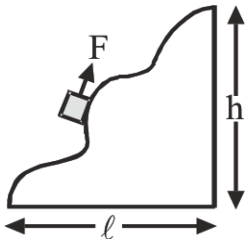
(1)


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

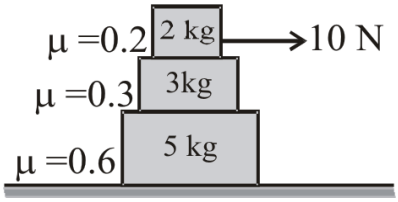
(4) Can't determined

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 $\sqrt{0.999}$:-

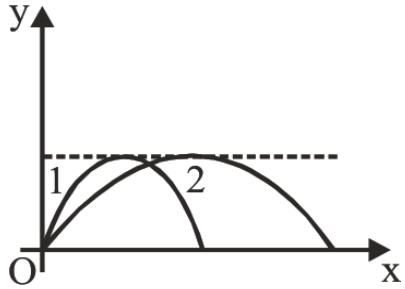
(1) 0.333 (2) 0.995

(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 $v_{0_1} < v_{0_2}$

SUBJECT : CHEMISTRY

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}

SUBJECT : BIOLOGY

41. Chloroplast are absent in-

(1) Fungi

(2) Some bacteria

(3) Multicellular animals

(4) All of these

42. In meiosis if leptotene, zygotene, Diakinesis, diplotene, Pachytene has given a number respectively 1, 2, 3, 4, 5 then arrange them in a sequence, they happens :

(1) $1 \longrightarrow 2 \longrightarrow 3 \longrightarrow 4 \longrightarrow 5$

(2) $1 \longrightarrow 2 \longrightarrow 5 \longrightarrow 4 \longrightarrow 3$

(3) $2 \longrightarrow 5 \longrightarrow 3 \longrightarrow 4 \longrightarrow 1$

(4) $2 \longrightarrow 1 \longrightarrow 3 \longrightarrow 5 \longrightarrow 4$

43. In two kingdom classification. The main character of the members of plantae was :-

(1) Autotrophic in nature

(2) Presence of cell wall

(3) Starch as reserve food

(4) Non motile organisms

44. Analyse the following characteristics and identify the group of organisms :-

(A)They reproduce sexually by the fusion of non-motile gametes

(B) They show complex developmental changes after fertilization

(C) Majority of organisms are marine with greater concentration found in warmer areas.

(D) They have chlorophyll-a,d and phycoerythrin as major pigments

(1) Phaeophyaceae

(2) Chlorophyaceae

(3) Rhodophyaceae

(4) Dinoflagellates

45. Taxonomically known number of species is

(1) 1.7 billion (2) 17 lakh

(3) 5-30 million (4) 17 million

46. In *Solanum tuberosum* first and second words represent respectively ?

(1) Genus, Generic name

(2) Specific epithet, species

(3) Specific epithet and generic name

(4) Generic name and specific epithet

47. *Chlorella* are placed according to Whittaker classification, in :

(1) Pyrophyta

(2) Protozoans

(3) Protista

(4) Both in pyrophyta and chrysophyta

48. Arrange the steps involve in sexual cycle in fungi in correct order :-

(1) Plasmogamy $\longrightarrow$ Karyogamy $\longrightarrow$ Zygote $\longrightarrow$ Meiosis $\longrightarrow$ Haploid spores

(2) Karyogamy $\longrightarrow$ Plasmogamy $\longrightarrow$ Zygote $\longrightarrow$ Meiosis $\longrightarrow$ Haploid spores

(3) Plasmogamy $\longrightarrow$ Karyogamy $\longrightarrow$ Zygote $\longrightarrow$ Haploid spores $\longrightarrow$ Meiosis

(4) Plasmogamy $\longrightarrow$ Zygote $\longrightarrow$ Karyogamy $\longrightarrow$ Meiosis $\longrightarrow$ Haploid spores

49. Sexual reproduction in fungi may occur by means of :-

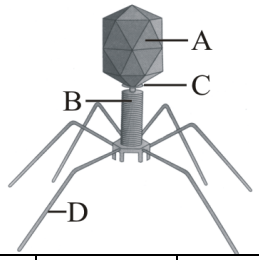
(1) Sporangiospore, Oospore and Ascospore

(2) Zoospore, Oospore and Ascospore

(3) Sporangiospore, Ascospore and basidiospore

(4) Oospore, Ascospore and Basidiospore

50. Given below is the diagram of a bacteriophage. In which one of the options, all the four parts A, B, C and D are correct ?



	A	B	C	D
(1)	Tail fibres	Head	Sheath	Collar
(2)	Sheath	Collar	Head	Tail fibres
(3)	Head	Sheath	Collar	Tail fibres
(4)	Collar	Tail fibres	Head	Sheath

51. Match the following -

Column-I		Column-II	
a.	Pneumotaxic Centre	I.	Highly sensitive to CO_2 and hydrogen ions
b.	Respiratory rhythm centre	II.	Pons region
c.	Chemosensitive area	III.	Medulla region
d.	Insignificant role in respiratory rhythm regulation	IV.	Oxygen

(1) a-I, b-II, c-III, d-IV

(2) a-II, b-III, c-I, d-IV

(3) a-IV, b-III, c-II, d-I

(4) a-III, b-II, c-I, d-IV

52. Choose the incorrect one given below :-

(1) Plateletes are cell fragments produced from megakaryocyte of bone marrow

(2) Neutrophills are most abundant cells of total WBC

(3) Basophills are least among the WBC

(4) A healthy adult has on average 5.5 million/mm^3 WBC

53. **Statement-I**: In the nephron, the descending limb of loop of Henle is impermeable to water and permeable to electrolytes.

Statement-II: The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

In the light of the above statements, choose the correct answer from the options given below :-

(1) Both Statement-I and II are correct.

(2) Both Statement-I and II are incorrect.

(3) Statement-I is correct but Statement-II is incorrect.

(4) Statement-I is incorrect but Statement-II is correct.

54. Which of the following represents the correct order of vertebral regions from superior to inferior?

(I) Sacrum (II) Thoracic (III) Cervical (IV) Lumbar (V) Coccyx

(1) I -II-III-IV-V (2) II-IV-I-III-V

(3) IV-I-II-V-I (4) III-II-IV-I-V

55. Read the following statements A-D

A. Our vertebral column is formed by 26 serially arranged units called vertebrae and is ventrally placed.

B. Vertebral column extends from the base of the skull and constitutes the main frame work of the trunk.

C. Each vertebra has a central hollow portion (neural canal) through which the spinal cord passes.

D. First vertebra is axis and it articulates with the occipital condyles

How many of the above statements are correct?

(1) Four (2) Three

(3) Two (4) One

56. **Assertion (A):** Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R): Common cause of Osteoporosis is increased levels of estrogen.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct and (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

57. Identify the correct match from Column - I and Column - II :

Column - I		Column - II	
(a)	*Scoliodon*	(i)	Saw fish
(b)	*Pristis*	(ii)	Sting ray
(c)	*Trygon*	(iii)	Electric ray
(d)	*Torpedo*	(iv)	Dog fish

Options:

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

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

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

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

58. The principal nitrogenous excretory compound in humans is synthesized :-

(1) In kidneys but eliminated mostly through liver

(2) In kidney as well as eliminated by kidneys

(3) In liver and also eliminated out from the body by the same

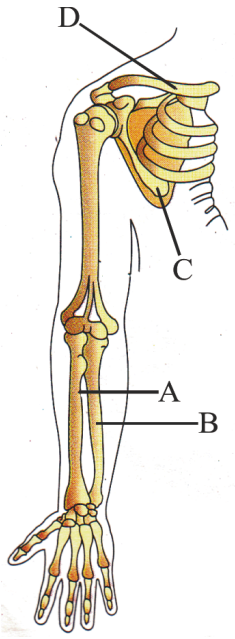
(4) In the liver, but eliminated out from the body mostly through kidneys

59. If in a person functional residual capacity is 2300 ml, residual volume is 1200 ml and inspiratory capacity is 3500 ml then find out its vital capacity-

(1) 5800 ml (2) 7000 ml

(3) 4600 ml (4) 2300 ml

60. In given diagram A,B,C and D respectively represents :-



(1) Radius, Ulna, Scapula, Clavicle

(2) Ulna, Radius, Scapula, Clavicle

(3) Radius, Ulna, Clavicle, Scapula

(4) Ulna, Radius, Clavicle, Scapula

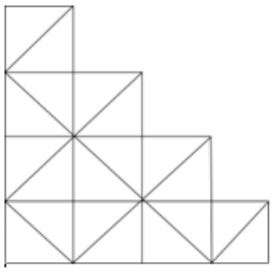
SUBJECT : MENTAL ABILITY

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

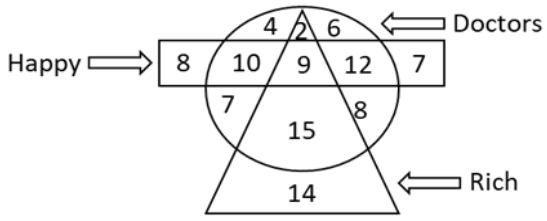
(2) Only II follows

(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

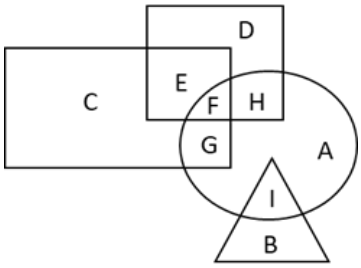
(2) 26

(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

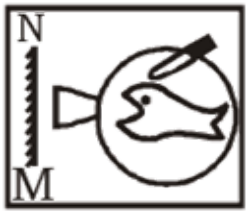
(2) 673451

(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