Integrated M.Sc. Entrance Examination - 2010

MM Marks: 75 Time : 2 hrs

Hall Ticket No.								

INSTRUCTIONS FOR STUDENTS

I. **Please enter your Hall Ticket Number on this page and on the OMR sheet without fail.**

II. **Read the following instructions carefully.**

1. Questions 1-25 are in Biology, 26-50 in Chemistry, 51-75 in Mathematics and 76-100 are in Physics.
2. Answer as many questions as you can. Each question carries 1 mark each wrong answer will be awarded -0.33. The maximum marks for the paper is 75.
3. Answers are to be marked on the OMR sheet following the instructions given there.
4. Hand over both the question paper and the OMR sheet at the end of examination.
5. Non-programmable calculators are allowed. Log tables and calculators are not allowed.
6. Rough work can be done anywhere on the question paper but not on the OMR sheet.
7. This book contains **26** pages including this paper and pages for the rough work. Please check that your question paper has all the pages.

S-01

1. Flat worms are

   A. radially symmetrical triploblastic coelomate animals
   B. bilaterally symmetrical, diploblastic, aceolomate animals
   C. bilaterally symmetrical, triplololoblastic, aceolomate animals
   D. radially symmetrical triploblastic acoelomate animals

2. Atrial natriuretic factor is a

   A. peptide hormone that lowers blood cholesterol
   B. peptide hormone that lowers blood pressure
   C. steroid hormone that lowers blood pressure
   D. steroid hormone that stimulates lipolysis

3. Depending on the mode of tree branches, *Tamarindus* is classified as a

   A. Caudex tree
   B. Excurrent tree
   C. Deliquescent tree
   D. procumbent tree

4. Two of the most important features of saturated fatty acids compared to unsaturated fatty acids

   A. no double bonds and low melting points
   B. no double bonds and higher melting point
   C. one or two double bonds with high melting points
   D. one or two double bonds with low melting points

5. Cone cells in retina are

   A. Less sensitive to light than rod cells and allow better perception of colour
   B. More sensitive to light than rod cells and allow better perception of colour
   C. Less sensitive to light than rod cells and very little role in colour perception
   D. More sensitive to light than rod cells but play very little role in colour perception

S-01

6. The two cerebral hemispheres in human brain are connected by a very large nerve bundle called

   A. Broca
   B. Wernicke
   C. Corpus collasum
   D. Chaism

7. Mendel's Law of dominance is used to explain

   A. that homozygous parent produces similar sex cells while heterozygotes produces two kinds of sex cells each with one allele of equal proportion
   B. domainance is an autonomous feature of a gene or its product
   C. dominance requires the participation of two alleles of a character
   D. expression of one of the parental characters in a monohybrid cross in the fillial 1 generation and both characters in the fillial 2 progeny

8. The immunity a new born baby gets from the mother's milk is called

   A. Acquired immunity
   B. Innate immunity
   C. Passive immunity
   D. Active immunity

9. In cyanobacteria, the site of photosynthesis is

   A. Thylakoids
   B. Chloroplasts with thylakoids
   C. Chlorosomes
   D. Intracytoplasmic membrane

10. Zymogens are

    A. active mitochondrial enzymes
    B. inactive unprocessed digestive enzymes
    C. inactive processed liver enzymes
    D. active unprocessed digestive enzymes

S-01

11. A degenerate genetic code means

A. Single codon codes for many amino acids
B. Multiple codons for multiple amino acids
C. Single amino acid is coded by more than one codon
D. Many codons specify the stop codons

12. An example of monoecious plant is

A. Chara
B. Marchantia
C. Sweet potato
D. Papaya

13. Gonadotrophin releasing hormone (GnRH) is produced by

A. Ovary
B. Hypothalamus
C. Testis
D. Adrenal gland

14. The stipules that are fused with the base of the petiole on either sides are called

A. Free-lateral stipules
B. Adnate stipules
C. Ochraceous stipules
D. Axillary stipules

15. Wings of a butterfly and birds represent

A. Analogous structures arose as a result of divergent evolution
B. Homologous structures arose as a result of divergent evolution
C. Homologous structures arose as a result of convergent evolution
D. Analogous structures arose as a result of converget evolution

16. Histamine is produced by

A. T lymphocytes
B. B lymphocytes
C. Basophils
D. Neutrophils

S - 01

17. A disease caused by fungus

    A. Malaria
    B. Filariasis
    C. Typhoid
    D. Ringworm

18. Protein synthesis an eukaryotic plant cell occurs in

    A. Cytosol
    B. Endoplasmic reticulum
    C. Choloroplasts and mitochondria
    D. In all the above organelles

19. The QRS peak of an ECG represents

    A. electrical excitation of the atria that leads to atrial contraction
    B. depolarization of ventricles that initiate ventricular contraction
    C. return of ventricles from excitation to normal state or repolarization
    D. end of systole

20. An operator is a

    A. DNA sequence that produces repressor protein and controls DNA synthesis
    B. DNA sequence that produces repressor protein and controls RNA synthesis
    C. A regulatory region in DNA that controls DNA synthesis
    D. A regulatory region in DNA that controls RNA synthesis

21. Sigma factor is

    A. part of DNA polymerase enzyme and plays a role in the initiation of DNA replication
    B. part of RNA polymerase enzyme and plays a role in the initiation of RNA synthesis
    C. part of DNA polymarase enzyme and plays a role in the termination of DNA synthesis
    D. part of RNA polymarase enzyme and plays a role in the initiation of protein synthesis

S-01

22. What factors contribute, most importantly, to population growth in a new habitat that is being colonized

A. natality and mortality
B. emigration
C. immigration
D. emigration, immigration and mortality

23. Sickle cell anemia disease is

A. Inborn metabolic disorder
B. Mendelian, sex linked recessive disorder
C. Non mendelian, autosome dominat disorder
D. Mendelian, autosome, recessive disorder

24. Individuals with blood group O are considered as universal donors. Which of the following statements best describes the individuals with O blood group

A. They do not have A and B antigen
B. They have no antibodies to antigen A or B
C. They have both A and B antigen and hence can donate blood to all
D. They have O antigens

25. In humans, which of the chromosome, mentioned below, contains the least number of genes

A. X chromosome
B. Y chromosome
C. Chromosome 1
D. Chromosome 6

26. The molecular formula of water is H_2O. The percentage of the weight of the two hydrogen atoms in the water molecule is (at. wt.: H=1.008, O=16.00)

A. 11.2%
B. 22.4%
C. 33.3%
D. 5.6%

S-01

27. Which one of the following species would be the least likely to act as a Lewis base?

A. CN^-

B. I^+

C. I^-

D. PCl_3

28. The molarity of NaOH in the solution prepared by dissovling 4 gm of NaOH in enough water to form 250 mL of solution is

A. 0.8M

B. 0.04M

C. 4M

D. 0.4M

29. The number of electrons, protons and neutrons in a species are equal to 18, 16 and 16 respectively. The proper symbol of the species is

A. $^{32}_{16}Ar$

B. $^{32}_{16}S$

C. $^{32}_{16}S^{2-}$

D. $^{32}_{16}S^{2-}$

30. The total number of orbitals associated with the principal quantum number n=3 is

A. 9

B. 18

C. 32

D. 24

31. Considering the atomic number and position in the periodic table, the arrangement of the following elements in the increasing order of metallic character is

A. Si<Mg<P<Be<Na

B. P<Si<Be<Mg<Na

C. Be<Mg<Si<P<Na

D. Na<Be<P<Mg<Na

S-01

32. The concentration of hydrogen ion in a sample of soft drink is 3.8×10^{-3}M. The pH of this sample is

A. 2.42
B. 4.22
C. 3.80
D. 3.83

33. The best reagent for the conversion of isopropyl alcohol to isopropyl bromide is

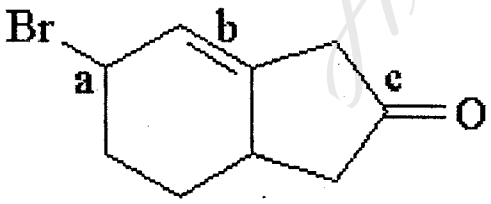
A. HBr
B. $SOBr_2$
C. CH_3MgBr
D. Br_2

34. The IUPAC name for the following compound is

$$CH_3 - C \equiv C - \underset{}{\overset{CH_3}{\overset{|}{CH}}} - CH = CH_2$$

A. 4-vinyl-2-pentyne
B. 4-methylhex-2-yn-5-ene
C. 3-methylhex-4-yn-1-ene
D. 3-methylhex-1-en-4-yne

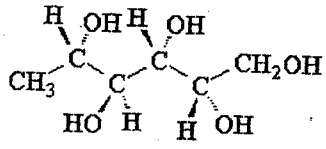
35. Which of the functional groups on the following molecule are susceptible to nucleophilic attack?

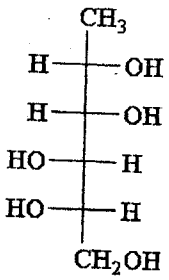


A. a and b
B. a and c
C. b and c
D. a, b and c

S-01

36. The following stereoisomers are related as





A. enantiomers
B. diasteromers
C. identical compounds
D. epimers

37. The states of hybridization of carbon in the following compounds are $H_2C{=}0$, CH_3F and $HC{\equiv}N$

A. sp^3, sp^2 and sp respectively
B. sp, sp^2 and sp^3 respectively
C. sp^2, sp^3 and sp respectively
D. sp^2, sp and sp^3 respectively

38. Which bond of the molecule $CH_3CH_2CH_2Br$ is expected to have least inductive effect?

A. bond between carbon-1 and hydrogen
B. bond between carbon-2 and hydrogen
C. bond between carbon-3 and bromine
D. bond between carbon-3 and hydrogen

39. The total number of π bonds found in the following compound is: $H\text{-}C{\equiv}C\text{-}CH_2\text{-}NO_2$

A. 1
B. 2
C. 3
D. 4

S-01

40. On complete combustion, 0.246 gm of an organic compound gave 0.198 gm of carbon dioxide and 0.1014 gm of water. The percentage composition of carbon and hydrogen in the compound are

A. 21.95 and 4.58% respectively

B. 4.58 and 21.95% respectively

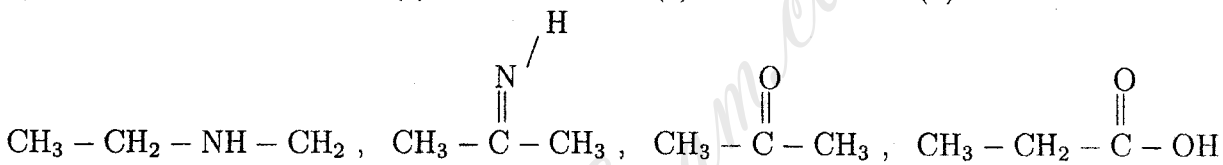
C. 51.51 and 47.48% respectively

D. 47.48 and 51.51% respectively

41. What is the major product of the following reaction?

$$CH_3 - C \equiv N \xrightarrow[Et_2O]{CH_3MgI} \xrightarrow{H_3O^{\oplus}}$$

(a) (b) (c) (d)



A. (b)

B. (c)

C. (d)

D. (a)

42. A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. The empirical formula of the compound should be

A. CH_2Cl

B. C_2HCl

C. $CHCl_2$

D. $CHCl$

43. The wavelength range of the visible spectrum extends from violet (400 nm) to red (750 nm). The frequencies (Hz) of this visible range are‘:

A. 4.0×10^{14} to 7.5×10^{14} Hz

B. 8.0×10^{14} to 15×10^{14} Hz

C. 2.0×10^{14} to 3.25×10^{14} Hz

D. 14×10^{14} to 14×10^{5} Hz

S-01

44. The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are

A. +3 and 5 respectively

B. +1 and 6 respectively

C. +3 and 6 respectively

D. +1 and 5 rexpectively

45. The hybridization occurred in P in PCl_5 molecule is:

A. dsp^2

B. sp^3d

C. sp^3

D. sp^3d^2

46. A Ne-O_2 mixture contains 70.6 gm of oxygen and 167.5 gm of neon. The pressure of the mixture of the gases in the concerned cylinder is 25 bar. The partial pressures of oxygen and neon in the mixture are (at. wt.: Ne=20.18, O=16.00)

A. 35.25 and 64.75 bar respectively

B. 50.55 and 49.45 bar respectively

C. 25.00 and 75.00 bar respectively

D. 5.25 and 19.75 bar respectively

47. The value of the equilibrium constant for the following reaction at 298 K
$2NH_3(g)+CO_2(g)=NH_2CONH_2(aq)+H_2O$ (liquid)
(standard Gibbs energy change ΔG°=-13.6 kJ mol^{-1} at that temperature) is:

A. 4.0×10^{14}

B. 2.4×10^{2}

C. 4.2×10^{3}

D. 3.0×10^{9}

48. Chlorophyll is associated with the metal

A. Mn

B. Mo

C. Co

D. Mg

S-01

49. The major product of the following reaction is
$CH_3CH_2CH_2COO^-Na^+ + NaOH + CaO \rightarrow$

A. butane

B. propane

C. pentane

D. acetone

50. Which of the following compounds will show cis-trans isomerism?

(i) $(CH_3)_2C{=}CH\text{-}C_2H_5$

(ii) $CH_2{=}CBr_2$

(iii) $C_6H_5CH{=}CH\text{-}CH_3$

(iv) $CH_3CH{=}CCl\text{-}CH_3$

A. (iii) and (iv)

B. (i) and (ii)

C. Only (i)

D. Only (ii)

51. The coefficient of x^6 in the expansion of $(3+2x)^{10}$ is

A. $3^4 \times 2^8 \times 5$.

B. $3^8 \times 2^4 \times 5$.

C. $3^8 \times 2 \times 5^4$.

D. $3 \times 2^4 \times 5^8$.

52. $\int \frac{(1+x)\exp(x)}{\cos^2(x\exp(x))}dx =$

A. $-\cot(x\exp(x)) + C$.

B. $\tan(x\exp(x)) + C$.

C. $\tan(\exp(x)) + C$.

D. $\cot(\exp(x)) + C$.

S-01

53. 10 people went to a party. Each person shook hands with each of the other 9. The number of hand shakes that took place is

    A. 100.

    B. 90.

    C. 50.

    D. 45.

54. The probability that at least one of the events A & B does not happen is 7/8. The probability of A & B occurring are 3/8 and 1/2 respectively. The probability of at least one of them occurring is

    A. 3/4.

    B. 1/2.

    C. 1/4.

    D. can not be determined from the information given.

55. A fair coin is tossed twice, the probability that heads show up at least once is

    A. 1/4.

    B. 1/2.

    C. 3/4.

    D. can not be determined.

56. The smallest positive integer n with the property that every integer greater than or equal n can be written as $5a + 7b$ for some positive integers a and b is

    A. 5.

    B. 7.

    C. 12.

    D. 31.

57. For a set X, let $\mathbb{P}(X)$ denote the power set of X. If A is a finite set such that there are 2^{24} elements in $\mathbb{P}(A \times \mathbb{P}(A))$, then the number of elements in A is

    A. 24.

    B. 8.

    C. 4.

    D. 3.

S-01

58. The number of 1-1 functions from $\{1,2,3,4,5,6,7,8,9\}$ to $\{1,2,3,4,5,6,7,8,9,10\}$ is

A. 10!.

B. 9!.

C. 90.

D. 10.

59. If A, B, C are nonsingular square matrices of order 3×3 then which of the following is not necessarily true?

A. $A^TA = I$ (where A^T represents the transpose of A).

B. ABC is nonsingular.

C. $A^{-1}B^{-1} = (BA)^{-1}$.

D. $(A-B)C = AC - BC$.

60. The number of subsets of $\{1,2,\cdots,10\}$ with three elements having non-empty intersection with $\{2,3\}$ is

A. 80.

B. 72.

C. 64.

D. 56.

61. If z_1, z_2, z_3, z_4, $z_5 \in \mathbb{C}$ are distinct complex numbers such that $(z_j)^5 = 1$ for $1 \leq j \leq 5$, then $z_1 + z_2 + z_3 + z_4 + z_5$ is equal to

A. 5.

B. 0.

C. 1.

D. $i\sqrt{5}$.

62. Let $x + iy \in \mathbb{C}$ and let w be the complex number obtained by reflecting $x + iy$ about the line $y = x$. Then,

A. $w = -x + iy$.

B. $w = -x - iy$.

C. $w = y + ix$.

D. $w = y - ix$.

S-01

63. Let $f : \mathbb{R} \to \mathbb{R}$ be a polynomial of degree 3 and let n be the number of real roots of f counted according to multiplicity. Then,

A. $n = 3$.

B. $n \geq 2$.

C. $n \geq 1$.

D. None of the above.

64. Let (a_n) be a sequence of real numbers and let $b_n = a_1 + \cdots + a_n$ for each $n \in \mathbb{N}$. If $\lim_{n\to\infty} b_n = \sqrt{2}$, then

A. $\lim\limits_{n\to\infty} a_n = \sqrt{2}$.

B. $\lim\limits_{n\to\infty} a_n = 0$.

C. there is $n_0 \in \mathbb{N}$ such that $a_n \geq 1$ for every $n \geq n_0$.

D. (a_n) is a decreasing sequence.

65. Let $f : \mathbb{R} \to \mathbb{R}$ be a continuous function such that $\int_{-2}^{2} f(x)dx = 0$. Then,

A. $f \equiv 0$.

B. $f(-x) = -f(x)$ for every $x \in [-2, 2]$.

C. $\int_{-1}^{1} f(x)dx = 0$.

D. None of the above.

66. An example of a continuous function $f : \mathbb{R} \to \mathbb{R}$ that is not differentiable at $\sqrt{2}$ is

A. $f(x) = |x + \sqrt{2}|$.

B. $f(x) = |x - \sqrt{2}|$.

C. $f(x) = |x| + \sqrt{2}$.

D. $f(x) = |x| - \sqrt{2}$.

67. Let $f : \mathbb{R} \to \mathbb{R}$ be defined as $f(x) = x^2$ if $x \leq 0$, and $f(x) = 2x$ if $x > 0$. Then,

A. f is not continuous.

B. f is continuous but not differentiable.

C. f is differentiable but f' is not differentiable.

D. f' is differentiable.

S-01

68. Let $f : \mathbb{R} \to \mathbb{R}$ be a differentiable function such that $f'(x) > 0$ for every $x \in \mathbb{R}$. Then,

A. $f(x) > 0$ for every $x \in \mathbb{R}$.

B. $f(x) > x$ for every $x \in \mathbb{R}$.

C. $\lim_{x \to \infty} f(x) = \infty$.

D. $f(x) < f(y)$ if $x < y$.

69. Consider the circles (i) $x^2 + y^2 + 6x + 8y = 0$, (ii) $2x^2 + 2y^2 + 6x + 8y + 2 = 0$ and (iii) $3x^2 + 3y^2 + 24x + 18y = 0$. Which of these pass through the origin, with radius 5?

A. Only (i).

B. Only (iii).

C. Both (i) and (iii)

D. All.

70. $\tan 75° - \cot 75° = ?$

A. $2\sqrt{3}$.

B. $2/\sqrt{3}$.

C. $\sqrt{3}/2$.

D. $-2/\sqrt{3}$.

71. $\dfrac{\cos 6\theta - \cos 4\theta}{\sin 6\theta + \sin 4\theta}$ is equal to

A. $\tan\theta$.

B. $-\tan\theta$.

C. $\tan 2\theta$.

D. $-\tan 2\theta$.

72. $\displaystyle\int \frac{x \tan^{-1} x}{(1+x^2)^{3/2}} dx$ is equal to

A. $\dfrac{-\tan^{-1} x}{\sqrt{x^2+1}} + \dfrac{x}{\sqrt{x^2+1}} + c.$

B. $\dfrac{\tan^{-1} x}{\sqrt{x^2+1}} + \dfrac{x}{\sqrt{x^2+1}} + c.$

C. $\dfrac{x}{\sqrt{x^2+1}} + c.$

D. None of the above.

S-01

73. On differentiating $\tan x$ with respect to $\sin^2 x$, we get

A. $\frac{\text{cosec}x \sec^3 x}{2}$.

B. $-\frac{\text{cosec}x \sec^3 x}{2}$.

C. $2\tan x$.

D. $-2\tan x$.

74. If $A = \begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ and $A - A^T = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$, then the value of α is

A. $\frac{\pi}{3}$.

B. $\frac{2\pi}{3}$.

C. $\frac{4\pi}{3}$.

D. $\frac{7\pi}{6}$.

75. If $(4-\sqrt{3})\sec^2\theta + 2(1-\sqrt{3})\sec\theta\tan\theta = 4$, then θ is equal to

A. $\frac{\pi}{3}, \frac{\pi}{6}$.

B. $-\frac{\pi}{3}, \frac{\pi}{6}$

C. $\frac{\pi}{3}, -\frac{\pi}{6}$

D. $-\frac{\pi}{3}, -\frac{\pi}{6}$.

76. If $x_1 = a\sin\left(\omega t + \frac{\pi}{6}\right)$ and $x_2 = a\cos\omega t$, the phase difference between the two waves is

A. $\pi/6$

B. $\pi/3$

C. $\pi/2$

D. π

S-01

77. An astronaut is approaching the moon. He sends out a radio signal of frequency 5000 MHz and the difference in frequency of the echo from that of the original frequency is 100 KHz. His velocity of approach with respect to the moon is

A. 2 km/s

B. 3 km/s

C. 4 km/s

D. 5 km/s

78. If one cup of ice at 0°C is mixed with one cup of water at 100°C, one gets

A. Two cups of water at temperature 50°C

B. More than two cups of water at temperature less than 50°C

C. Two cups of water at temperature greater than 50°C

D. Less than two cups of water at temperature less than 50°C

79. An object is kept at a distance 10 cm from a symmetric thin lens made of glass (refractive indedx $n = 1.65$). If the real, inverted image magnified by 1.2 times is formed, then the radius of curvature of the lens and the distance of image are,

A. 6 cm, 12 cm

B. 6.5 cm, 11 cm

C. 7 cm, 12 cm

D. 7.5 cm, 11 cm

80. A particle is moving along the y-axis such that its position from origin as a function of time (in seconds) is $y(t) = 7.9 + 6t + \frac{1}{2}t^2$. The most appropriate statement about this motion is

A. Uniform motion,

B. Uniformly accelerated motion,

C. Accelerated motion

D. Uniformly retarded motion

81. A stone is thrown with an initial velocity of 10 m/s such that it covers maximum possible horizontal distance R_E on earth's surface. If the same stone is thown at an angle 15° (with respect to the moon's surface) the horizontal distance covered on the moon's surface (acceleration due to gravity on earth and moon are $g_E = 9.8m/s^2$, $g_M = 1.6m/s^2$, respectively) will be

A. 0.3265 R_E

B. $\frac{R_E}{0.3265}$

C. $\frac{0.3265}{R_E}$

D. 3.069 R_E

82. Ten liters of water per second is lifted from well through 20 m and delivered with a velocity of 10 m/s, then the power of the motor is:

A. 1.5 kW

B. 2.5 kW

C. 3.5 kW

D. 4.5 kW

83. If the radius of the earth shrinks by 1%, the acceleration due to gravity on the earth's surface would (mass remaining constant)

A. increase by 1%

B. decrease by 1%

C. decrease by 2%

D. increase by 2%

84. Two capacitors A and B having capacities 10 μF and 20 μF are connected in series with a 12 V battery. The ratio of the charges on A and B is:

A. 1:3

B. 1:1

C. 2:1

D. 2:4

85. A bullet of mass m moving with a velocity 10 m/s hits a body of mass $3m$ which is at rest and gets stuck with it. The fraction of the original kinetic energy which gets converted into heat is

A. 3/4

B. 1/3

C. 1/4

D. 5/2

S-01

86. The equation of an alternating voltage is given by $V = 200 \sin 314t$, the frequency of the voltage waveform is

A. 50 Hz

B. 60 Hz

C. 55 Hz

D. 65 Hz

87. Bernoulli's equation is a statement of conservation of

A. mass

B. momentum

C. energy

D. angular momentum

88. The impurity added in Germanium crystal to make n-type semiconductor is

A. Aluminium

B. Gallium

C. Indium

D. Phosphorous

89. A p-n diode is reverse biased. The resistance measured by an ohm meter connected across it will be

A. zero

B. low

C. high

D. infinite

90. A block of mass 2 kg, placed on a long frictionless horizontal table, is pulled horizontally by a constant force F. It is found to move 10 m in the first two seconds. The magnitude of F is

A. 5 N

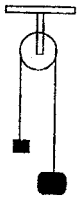
B. 10 N

C. 20 N

D. 25 N

S-01

91. In a simple Atwood machine, two unequal masses m_1 and m_2 are connected by a string going over a clamped light smooth pulley. In a typical arrangement shown as in figure $m_1 = 300g$ and $m_2 = 600g$. The system is released from rest. The force exerted by the clamp on the pulley is



A. 0.49 N

B. 4.9 N

C. 7.8 N

D. 78 N

92. A particle is kept fixed on a turn table rotating uniformly. As seen from the ground, the particle goes in a circle, its speed is 20 cm/s and acceleration is 20 cm/s^2. The particle is now shifted to a new position to make the radius half of the original value. The new values of the speed and acceleration will be

A. 10 cm/s, 10 cm/s^2,

B. 10 cm/s, 80 cm/s^2

C. 40 cm/s, 10 cm/s^2

D. 40 cm/s, 40 cm/s^2

93. A 250 g block slides on a rough horizontal table. The coefficient of friction between the table and the block is 0.1. The distance the block moves before coming to rest is

A. 0.41 cm

B. 0.82 cm

C. 4.1 cm

D. 8.2 cm

94. Two blocks of masses 10 kg and 20 kg are placed on the X-axis. The first mass is moved on the axis by a distance of 2 cm. The distance by which the second mass has to be moved to keep the position of the center of mass unchanged is

A. 0.2 cm

B. 0.5 cm

C. 1 cm

D. 1.5 cm

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95. Two small bodies of masses 10 kg and 20 kg are kept a distance 1.0 m apart and released. Assuming that only mutual gravitational forces are acting, the speed of the 10 kg mass when the separation decreases to 0.5 m is (G=6.67 $\times$ $10^{-11}\frac{Nm^2}{kg^2}$)

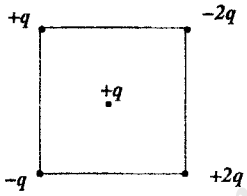
A. 4.2×10^{-5} m/s

B. 3.9×10^{-5} m/s

C. 3.9×10^{-6} m/s

D. 4.2×10^{-6} m/s

96. Four charges are placed on the corners of a square of side 5cm as shown in the figure with $q = 1.0 \times 10^{-8}C$. The force on a charge $1.0 \times 10^{-8}C$ placed at the center is



A. 0.25×10N

B. 0.36×10N

C. 0.36×10^{-3}N

D. 0.25×10^{-3}N

97. An organic liquid has a surface tension of $0.028N/m$ and a density of $0.7gm/cc$. If the liquid fills a glass tube of diameter $0.06cm$ by capillary action, the height of the liquid column (assuming the angle of contact to be zero) is

A. 1.16 cm

B. 1.72 cm

C. 2.25 cm

D. 2.72 cm

98. Among three turning forks A, B and C, natural frequency of A is 2% greater than that of B and frequency of C is 3% smaller than that of B. When A and C are resonated togther, 8 beats are heard. Frequency of fork B is

A. 80Hz

B. 100Hz

C. 160Hz

D. 220Hz

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99. In a 14 cm long rubber tube standing waves are produced in four segments. If the velocity of the wave is 24.5 m/s, the frequency of the wave is

    A. 2.2Hz

    B. 3.5Hz

    C. 6.0Hz

    D. 7.5Hz

100. A brass wire of radius r and steel wire of radius R, both of same length, get extended by 1mm under the same force. Given Young's modulus of brass and steel are $10^{10}N/m^2$ and $2 \times 10^{10}N/m^2$respectively, their radii are related as

    A. $R = \frac{r}{\sqrt{2}}$

    B. $R = \frac{r}{2}$

    C. $R = \sqrt{r}$

    D. $R = 2r$

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