NEW STANDARD ACADEMY

PHYSICS

1. A man pushes a wall and fails to displace it. He does
   (a) negative work　　(b) positive work
   (c) no work at all　　(d) can't say

2. A porter carrying a suitcase on his head moves from rest on a horizontal road to another point and finally is at rest. Then he does
   (a) maximum work　　(b) +ve work
   (c) zero work　　(d) -ve work

3. When the bob of a simple pendulum swings, the work done by tension in the string is
   (a) > 0　　　　(b) < 0
   (c) zero　　　　(d) maximum

4. In case of circular motion of a body, if tangential force also acts on the body in addition to centripetal force, then work done
   (a) by both the forces is zero
   (b) by both the forces is positive
   (c) by centripetal force is zero but work done by tangential force is not zero
   (d) by tangential force is zero by work done by centripetal force is not zero

5. Under the action of a force, A 2 kg body moves such that its position x as a function of time is given by $x = t^3/3$, where x is in m and r in s. The work done by the force in the first two seconds is
   (a) 1.6 J　　　　　　(b) 16 J
   (c) 160 J　　　　　　(d) 1600 J

6. When the cord is burnt with a match releasing the spring the two masses fly apart with equal
   (a) kinetic energy　　(b) speed
   (c) momentum　　　(d) acceleration

7. Which one is correct?

   (a) Both masses will have equal KE
   (b) Lighter block will have greater KE
   (c) Heavier block will have greater KE
   (d) None of above answers is correct

8. Which of the following energies is conserved for the system?
   (a) Kinetic energy　　(b) Potential energy
   (c) Mechanical energy(d) None of these

9. A man pushes a wall and fails to displace it. He does
   (a) negative work
   (b) positive but not maximum work
   (c) no work at all　　(d) maximum work

10. You lift a heavy book from the floor of the room and keep it in the book-shelf having a height 2 m. In this process you take 5 seconds. The work done by you will depend upon
    (a) mass of the book and time taken
    (b) weight of the book and height of the book-shelf
    (c) height of the book-shelf and time taken
    (d) mass of the book, height of the book-shelf and time taken

11. A body of mass 10 kg is dropped to the ground from a height of 10 metres. The work done by the gravitational force is (g = 9.8 m/sec^2)
    (a) -490 Joules　　　(b) +490 Joules
    (c)-980 Joules　　　(d) +980 Joules

12. A particle moves under the effect of a force $F = Cx$ from $x = 0$ to $x = x_1$. The work done in the process is
    (a) C x_1^2　　　　(b) $\frac{1}{2}$C x_1^2
    (b) Cx_1　　　　　(d) Zero

13. A spring 40 mm long is stretched by the application of a force. If 10 N force required to stretch the spring through 1 mm, then work done in stretching the spring through 40 mm is

(a) 84 J   (b) 68 J
(c) 23 J   (d) 8J

14. A man is riding on a cycle with velocity 7.2 km/hr up a hill having a slope 1 in 20. The total mass of the man and cycle is 100 kg. The power of the man is
   (a) 200 W   (b) 175 W
   (c) 125 W   (d) 98 W

15. A man starts walking from a point on the surface of earth (assumed smooth) and reaches diagonally opposite point. What is the work done by him
   (a) Zero   (b) Positive
   (c) Negative   (d) Nothing can be said

16. A person holds a bucket of weight 60 N. He walks 7 m along the horizontal path and then climbs up a vertical distance of 5 m. The work done by the man is
   (a) 300 J   (b) 420 J
   (c) 720 J   (d) none of these

17. If a person is pushing a box inside a moving train, the work done in the frame of earth will be: Let $\vec{s}_0$ is the displacement of train and vec S is the displacement of box in the train.
   (a) $\vec{F} \cdot \vec{s}_0$ (b) $\vec{F} \cdot \vec{s}$
   (c) $\vec{F} \cdot \vec{s} + \vec{s}_0$ (d) zero

18. The work done in moving a body of mass 4 kg with uniform velocity of 5m s^{-1} for 10 seconds on a surface of $\mu = 0.4$ is (take g = 9.8m / s^2)
   (a) 584 J   (b) 784 J
   (c) 684 J   (d) 484 J

19. A force of $\vec{F} = 2x\ \hat{\imath} + 2\ \hat{\jmath} + 3z^2\ \hat{k}$ N is acting on a particle. Find the work done by this force in displacing the body from (1, 2, 3) m to (3, 6, 1) m.
   (a) -10 J   (b) 100 J
   (c) 10 J   (d) 1 J

20. If we shift a body in equilibrium from A to C in a gravitational field via path AC or ABC
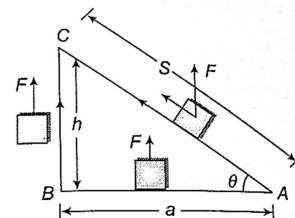

   (a) the work done by the force $\vec{F}$ for both paths will be same
   (b) $W_{AC} > W_{ABC}$ (c) $W_{AC} < W_{ABC}$
   (d) none of the above

21. A particle of mass 1 kg is moving a circular path of radius 1 m. Its kinetic energy is K = bt^4 where b = 1J / s The force acting on the particle at t = 1s is $(2x)^{1/2}$ m / s^2 . Find the value of x.

22. The work done by a force F= 2(x + 4y) i +8x$\hat{\jmath}$ N on a particle moving from origin to (4 m, 2 m, 0) along the path $x^2 = 8y$ is 10n J. Find the value of n

23. In the situation in figure, a block of mass 1 kg is attached to a light spring of constant 40 N/m whose other end is fixed to the roof of a building 50 cm above the smooth horizontal surface. Initially, spring is in natural length and vertical. When a force F = $20\sqrt{3}$ N is applied on the block, the block starts to move. The speed at the instant it breaks off the surface below it is$\sqrt{10n}$ m / s Find the value of n.
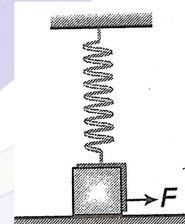
24. A block of mass 10 kg is suspended through an elastic 54 light rubber thread. An extra force F is applied downward and is slowly increased. When F = F_0 = 300 N the thread breaks. If a constant force F_1 is applied at the place of extra force F_1. The minimum value of F_1 (in newton) such thread breaks is 1.5 x 10^n N. Find the value of n.

25. Two blocks A and B of equal masses (m = 10 kg) are connected by a light spring of spring constant k = 150 N/m. The system

is in equilibrium. The minimum value of initial downward velocity v_0 of the block B for which the block A bounce up is $\frac{20}{\sqrt{3n}}$ m/s. Find the value of n
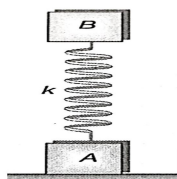
CHEMISTRY

26. Formula of a metallic oxide is MO. The formula of its phosphate will be
    (a) $M_2(PO_4)_2$ (b) $M(PO_4)$
    (c) M_2PO_4 (4) $M_3(PO_4)_2$

27. Which bond angle θ would result in the maximum dipole moment for the triatomic molecule YXY?
    (a) $\theta = 90°$ (b) $\theta = 120°$
    (c) $\theta = 150°$ (4) $\theta = 180°$

28. In a double bond connecting two atoms, there is a sharing of
    (a) 2 electrons   (b) 1 electron
    (c) 4 electrons   (d) All electrons

29. A sp^3 hybridized orbital contains
    (a) 1/4 s-character   (c) 1/2s-character
    (c) 2/3 s-character   (d) 3/4 s-character

30. The bond length of HCI molecule is 1.275 Å and its dipole moment is 1.03 D. The ionic character of the molecule (in percent) (charge of the electron = 4.8×10^{-10}) is
    (a) 100   (b) 67.3
    (c) 33.66   (d) 16.83

31. The electronic structure of four elements A, B, C, D are
    (A) $1s^2$ (B) $1s^2 2s^2 2p^2$
    (C) $1s^2 2s^2 2p^5$ (D) $1s^2 2s^2 2p^6$
    The tendency to form electrovalent bond is largest in
    (a) A   (b) B
    (c) C   (d) D

32. Highest covalent character is found in
    (a) CaF_2 (b) $CaCl_2$
    (c) $CaBr_2$ (4) CaI_2

33. Which one of the following species is diamagnetic in nature?
    (a) He_2^+ (b) H_2
    (c) H_2^+ (d) H_2^-

34. Which of the following fluoride of Xenon has zero dipole moment?
    (a) XeF_2 (b) XeF_3
    (c) XeF_4 (d) XeF_6

35. Pick out the molecule which has zero dipole moment.
    (a) NH_3 (b) H_2O
    (c) BCl_3 (d) SO_2

36. In which of the following species only one type of hybridisation is present?
    (a) $CH_3 - CH_2 - CH = CH_2$
    (b) $CH_3-CH=CH-CH_2^+$
    (d) $CH_2 = CH - CH = CH_2$
    (4) $CH_3 - CH =CH-CH_2^-$

37. Bond order in species is as the following
    (a) $O_2 > O_2^+ > O_2^-$
    (b) $O_2^+ > O_2 > O_2^-$
    (c) $O_2^- > O_2 > O_2^+$
    (d) $O_2^+ > O_2^- > O_2$

38. Bond angle between two hybrid orbitals is 105°. % s-orbital character of hybrid orbital is
    (a) Between 20-21%
    (b) Between 19-20%
    (c) Between 21-22%
    (d) Between 22-23%

39. Using MOT, compare O_2^+ and O_2^- species, choose the incorrect option.
    (a) O_2^+ is diamagnetic while O_2^- is paramagnetic
    (b) O_2^+ have higher bond order than O_2^-
    (c) Both O_2^+ and O_2^- are paramagnetic
    (d) O_2^- is less stable

40. PCl_5, exists but NCl_5, does not because
    (a) Nitrogen has no vacant d-orbitals
    (b) NCl_5, is unstable
    (c) Nitrogen atom is much smaller
    (d) Nitrogen is highly inert

41. Identify the T-shaped molecule in the following.
    (a) BF_3 (b) NH_3
    (c) NF_3 (d) ClF_3

42. Structure of BrF_3 is
    (a) Trigonal bipyramidal
    (b) Perfect T-shaped
    (c) Bent T-shaped
    (d) Trigonal planar

43. The number of lone pair(s) of electrons on the central atom in $[BrF_4]^-$, XeF_6, and $[SbCl_6]^{3-}$ are, respectively
    (a) 2, 0 and 1   (b) 1,0 and 0
    (c) 2, 1 and 1   (d) 2, 1 and 0
44. Which of the following pairs contains 2 lone pairs of electrons on the central atom?
    (a) I_3^+, H_2O (b) H_2O, NF_3
    (c) XeF_4, NH_3 (d) SO_4^{2-}, H_2S
45. Which of the following molecules has maximum value of dipole moment?
    (a) $CH_3 - O - CH_3$ (b) $CH_3 - Cl$
    (c) $CH_3 - CN$ (d) $CH_3 - CH_2 - CH_3$
46. The dipole moment of a diatomic molecule is 2.6×10^{-30} cm and interatomic spacing is 1.41 Å. The percent ionic character of the molecule is _____
47. The B.O of C_2 is _____
48. In SF_4 S atom has dsp^x hybridisation. What is the value of x?
49. How many of the following are paramagnetic? C_2, B_2, O_2^{-2} BN, $C l_2^+$ and NO^+
50. The number of resonating structures exist for the azide ion, N_3^- are _____

MATHS

51. If $\log 2$, $\log (2^n-1)$ and $\log (2^n+3)$ are in A.P, then n =
    (a) 5/2   (b) $\log_2 5$
    (c) $\log_3 5$ (d) 3/2
52. $\frac{\frac{1}{2} \cdot \frac{2}{2}}{1^3} + \frac{\frac{2}{2} \cdot \frac{3}{2}}{1^3+2^3} + \frac{\frac{3}{2} \cdot \frac{4}{2}}{1^3+2^3+3^3} + \cdots n\ terms =$
    (a) $\left(\frac{n}{n+1}\right)^2$ (c) $\left(\frac{n}{n+1}\right)^3$
    (c) $\left(\frac{n}{n+1}\right)$ (d) $\left(\frac{1}{n+1}\right)$
53. If A and G are arithmetic and geometric means and $x^2-2Ax+ G^2=0$, then
    (a) A = G   (b) A > G
    (c) A < G   (d) A = -G
54. The sum to infinity of the progression $9 - 3 + 1 - \frac{1}{3} + \cdots is$
    (a) 9   (b) 9/2
    (c) 27/4   (d) 15/2
55. If $\tan B = \frac{2 \sin A\ si\ \ C}{Sin\ (A+C)}$, then tan A, tan B and tan C are in
    (a) Arithmetic progression

(b) Harmonic progression
(c) Geometric progression
(d) Arithmetico – geometric progression
56. If the sum of the series $1+3x+9x^2+27x^3+\ldots\infty$ is a finite number, then
    (a) x > 1/3   (b) x < -1/3
    (c) 0 < |x| < 1/3   (d) none of these
57. If $(1^2-t_1)+(2^2+t_2)+\ldots+(n^2-t_n) = \frac{1}{3}n(n^2 - 1)$, then t_n is equal to
    (a) n^2 (b) 2n
    (c) n^2-2n (d) none of these
58. If $1^2+2^2+3^2+\ldots+2003^2=(2003)(4007)(334)$ and (1) (2003) +(2)(2002)+(3)(2001)+..+(2003)(1)=(2003) (334) (x), then x equals
    (a) 2005   (b) 2004
    (c) 2003   (d) 2001
59. If $a,b,c \in R^+$ then $\frac{bc}{b+c} + \frac{ac}{a+c} + \frac{ab}{a+b}$ is always
    (a) $\leq \frac{1}{2}(a + b + c)$ (b) $\geq \frac{1}{3}\sqrt{abc}$
    (c) $) \leq \frac{1}{3}(a + b + c)$ (d) $\geq \frac{1}{2}\sqrt{abc}$
60. If the first term of an A.P. is 2 and the sum of the first five terms is equal to one-fourth of the sum of the next five terms, find the sum of first 30 terms. Also find its 20th term.
    (a) -112   (b) 110
    (c) -110   (d) 113
61. An N.G.O. wants to invest ₹300000 in a bond which pays 5% annual interest first year, 6% Interest second year, 7% interest third year and so on. The interest received per year is to be utilized for the education of poor people. If the investment is done for 10 years, find the total nterest received by N.G.O.
    (a) 286000   (b)265000
    (c) 295000   (d) 285000
62. Find three numbers in G.P. whose product is 216 and the sum of their products in pairs is 156.
    (a) 2,7,18 or 18,5,2   (b) 2,6,18 or 18,6,2
    (c) 3,6,18 or 18,6,3   (d) 2,6,19 or 17,6,2
63. Find the sum of the series to n terms 8+88+888+…

(a) $\frac{8}{81}[10^{n+1} - 9n - 10$

(b) $\frac{8}{81}[10^{n+1} + 9n + 10$

(c) $\frac{8}{81}[10^{n+1} - 81n - 10$

(d) $\frac{8}{81}[10^{n+1} + 81n + 10$

64. If 19th term of a non-zero A.P. is zero, then its (49th term): (29th term) is

(a) 3:1 (b) 4:1

(c) 2:1 (d) 1:3

65. Let S_n denote the sum of the first n terms of an A.P.. If $S_4 = 16$ and $S_6 = -48$ then S_{10} is equal to

(a) -410 (b) -260

(c) -380 (d) -320

66. Let a_1, a_2 ,...,a_{10} be a G.P.. If $\frac{a_3}{a_1} = 25$ then $\frac{a_9}{a_5}$ equals

(a) $2(5^2)$ (b) $4(5^2)$

(c) 5^4 (4) 5^3

67. In an increasing geometric series, the sum of the second and the sixth term is 25/2 and the product of the third and fifth term is 25. Then, the sum of 4 th 6 th and 8 th terms is equal to:

(a) 30 (b) 26

(c) 35 (d) 32

68. Let the first term a and the common ratio r of a geometric progression be positive integers. If the sum of squares of its first three terms is 33033, then the sum of these three terms is equal to

(a) 210 (b) 231

(c) 220 (d) 241

69. $\frac{1}{3^2-1} + \frac{1}{5^2-1} + \frac{1}{7^2-1} + \cdots + \frac{1}{(201)^2-1}$ is equal to

(a) $\frac{101}{404}$ (b) $\frac{25}{101}$

(c) $\frac{101}{408}$ (d) $\frac{99}{400}$

70. Let α and β be the roots of the equation $px^2 + qx - r = 0$ where $p \neq 0$ If p, q and r be the consecutive terms of a non-constant GP and $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{3}{4}$, then the value of $(\alpha - \beta)^2$ is

(a) 8 (b) 9

(c) 20/3 (d) 80/9

71. Let 1/16 a and b be in G.P. and 1/a, 1/b, 6 be in A.P., where a, b ,> 0 Then 72(a + b) is equal to_____

72. If S = 7/5 + 9/5^2 + 13/5^3 + 19/5^4 +..., then 160 S is equal to _____

73. The sum of the series 1+ 2× 3 + 4 + 5 × 6 + 7 + 8 × 9 + $\cdots$ up to 50 terms is

74. The common ratio of a G.P. is - $\frac{4}{5}$ and the sum to infinity is $\frac{80}{9}$. Find the first term.

75. If a,b and c are three positive integers forming an increasing G.P such that b –a is a perfect cube and $\log_6 a + \log_6 b + \log_6 c = 6$, then a + b+ c =