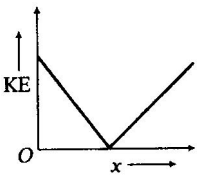
PHYSICS

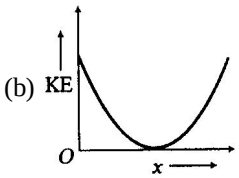
01. The dimensions of impulse are equal to that of
(a) force (b) linear momentum
(c) pressure (d) angular momentum

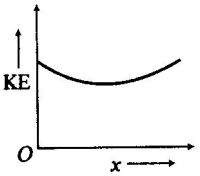
02. The heat generated in a wire depends on the resistance, current and time. If the error in measuring the above are 1%, 2% and 1%, respectively. The maximum error in measuring the heat is
(a) 8% (b) 6%
(c) 18% (d) 12%

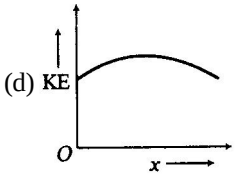
03. Find the torque of a force $F = -3\hat{i} + 2\hat{j} + \hat{k}$ acting at the point $r = 8\hat{i} + 2\hat{j} + 3\hat{k}$
(a) $14\hat{i} - 38\hat{j} + 16\hat{k}$ (b) $4\hat{i} + 4\hat{j} + 6\hat{k}$
(c) $-14\hat{i} + 38\hat{j} - 16\hat{k}$ (d) $-4\hat{i} - 17\hat{j} + 22\hat{k}$

04. A ball is thrown up with a certain velocity at an angle θ to the horizontal. The kinetic energy KE of the ball varies with horizontal displacement x as

(a) 

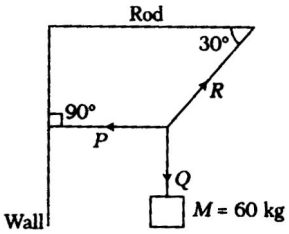
(b) 

(c) 

(d) 

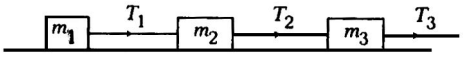
05. Four bodies P, Q, R and S are projected with equal velocities having angles of projection 15°, 30°, 45° and 60° with the horizontal respectively. The body having shortest range is
(a) P (b) Q
(c) R (d) S

06. A body of mass 60 kg suspended by means of three strings, P, Q and R as shown in the figure is in equilibrium. The tension in the string P is



(a) 130.9 kgf (b) 60 kgf
(c) 50 kgf (d) 103.9 kgf

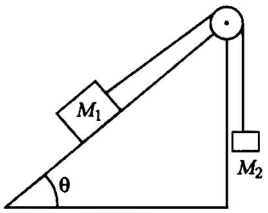
07. Three blocks of masses m_1, m_2 and m_3 are connected by massless strings as shown on a frictionless table. They are pulled with a force $T_3 = 40$ N. If $m_1 = 10$ kg, $m_2 = 6$ kg and $m_3 = 4$ kg, the tension T_2 will be



(a) 20 N (b) 40 N
(c) 10 N (d) 32 N

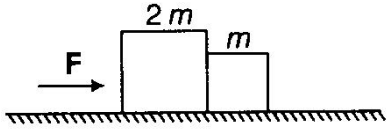
08. Two masses M_1 and M_2 are attached to the ends of a string which passes over a pulley attached to the top of an inclined plane. The angle of inclination of the plane is 30° and $M_1 = 10$ kg, $M_2 = 5$ kg. What is the acceleration of mass M_2?

ROUGH WORK



(a) 10 ms^{-2} (b) 5 ms^{-2}
(c) Zero (d) None of these

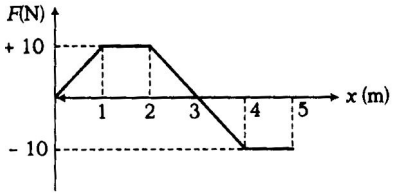
09. Two blocks are in contact on a frictionless table. One has mass m and the other 2m. A force F is applied on 2m as shown in the figure. Now the same force F is applied from the right on m. In the two cases the ratio of force of contact between the two blocks will be



(a) same (b) 1 : 2
(c) 2 : 1 (d) 1 : 3

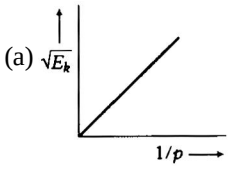
10. The net work done by kinetic friction
(a) is always negative
(b) is always zero
(c) may be negative or positive
(d) is always positive

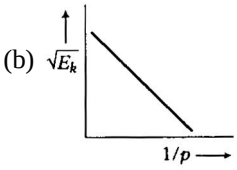
11. A position dependent force F is acting on a particle and its force-position curve is shown in the figure. Work done on the particle, when its displacement is from 0 to 5 m is

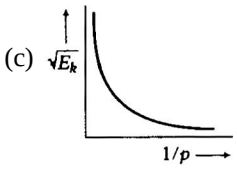


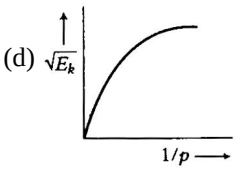
(a) 35 J (b) 25 J
(c) 15 J (d) 5 J

12. The graph between $\sqrt{E_k}$ and 1/p is
(E_k = kinetic energy and p = momentum)

(a) 

(b) 

(c) 

(d) 

13. A particle moves in a uniform circular motion. Choose the wrong statement.
(a) The particle moves with constant speed
(b) The acceleration is always normal to the velocity
(c) The particle moves with uniform acceleration
(d) The particle moves with variable velocity

14. The angular momentum of a rotating body changes from A_0 to $4A_0$ in 4 min. The torque acting on the body is

(a) $\frac{3}{4}A_0$ (b) $4A_0$

(c) $3A_0$ (d) $\frac{3}{2}A_0$

15. A body is falling under gravity. When it loses a gravitational potential energy by U, its speed is υ. The mass of the body shall be

(a) $\frac{2U}{v}$ (b) $\frac{U}{2v}$ (c) $\frac{2U}{v^2}$ (d) $\frac{U}{2v^2}$

16. A particle is moving in a circle with uniform speed v. In moving from a point to another diametrically opposite point
(a) the momentum changes by mv
(b) the momentum changes by 2 mv
(c) the kinetic energy changes by $\left(\frac{1}{2}\right)$ mv^2
(d) the kinetic energy changes by mv^2

ROUGH WORK

17. If M is the mass of the earth and R its radius, then ratio of the gravitational acceleration and the gravitational constant is

(a) $\frac{R^2}{M}$ (b) $\frac{M}{R^2}$

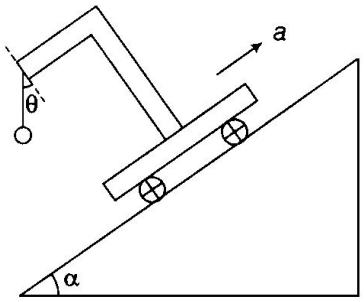
(c) MR^2 (d) $\frac{M}{R}$

18. A body of mass 2 kg is projected at $20ms^{-1}$ at an angle 60° above the horizontal. Power due to the gravitational force at its highest point is

(a) 200 W (b) $100\sqrt{3}$ W

(c) 50 W (d) zero

19. A pendulum of mass m hangs from a support fixed to a trolley. The direction of the string (i.e., angle θ) when the trolley rolls up a plane of inclination α with acceleration a is



(a) 0 (b) $\tan^{-1}\alpha$

(c) $\tan^{-1}\left(\frac{a+g\sin\alpha}{g\cos\alpha}\right)$ (d) $\tan^{-1}\frac{a}{g}$

20. Kinetic energy of a particle moving in a straight line varies with time t as $K = 4t^2$. The force acting on the particle
(a) is constant
(b) is increasing
(c) is decreasing
(d) first increases and then decreases

CHEMISTRY

21. Giant organic acid and base used to remove ions present in hard water. It can exchange H^+ with
(a) Ca^{++}, Mg^{++} ion
(b) SO_4^{2-}, NO_3^- ions
(c) $Ca^{++}, Mg^{++}, SO_4^{2-}, NO_3^-$
(d) $Ca^{++}, Mg^{++}, NO_3^-, SO_4^{2-}, HCO_3^-$

22. The strength of 20 volume H_2O_2 solution-
(a) 60.6 gm/lit
(b) 6 .06%
(c) 1.76 M
(d) All of these

23. Last drop of water removed from H_2O_2 by
(a) Simple distillation
(b) Fractional distillation
(c) Fractional Freezing
(d) Distillation under reduced pressure

24. Colloidal Pd, Pt accomodate a very large volume of Hydrogen therefore can be used as-
(a) Storage for hydrogen
(b) Source of energy
(c) Hydrogen provider in hydrogenation reaction
(d) All of these

25. Using stock notation the correct representation of compound-
(a) $KMnO_4$ - $KMn(VII)O_4$
(b) $HAuCl_4$ - $HAu(I)Cl_4$
(c) CuO - Cu(I)O
(d) Tl_2O - $Tl_2(IV)O$

26. In the following equation one that is not the example of disproportionation Reaction.

(a) $HCHO + NaOH \longrightarrow HCOONa + CH_3OH$

(b) $H_2SO_4 + BaCl_2 \longrightarrow BaSO_4 + 2HCl$

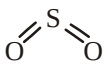
(c) $P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + 3NaH_2PO_2$

(d) $3I_2 + 6\ NaOH \longrightarrow 5NaI + NaIO_3 + 3H_2O$

ROUGH WORK

27. Dipole moment of a triatomic molecule is 5.44×10^{-30} c.m select the correct structure.

(a) O = S = O (b) $:\bar{C} \equiv \overset{+}{O}:$

(c) O = C = O (d) 

28. The group of molecules having identical shape

(a) SF_4, XeF_4 CCl_4 (b) ClF_6^+, $XeOF_2$ XeF_3^+

(c) BF_3, ClF_3, XeO_3 (d) ClF_3 $XeOF_2$ XeF_3^+

29. Which of the following structure is not produced by Sp^3d hybridisation.

(a) Triangular planar (b) Sea-Saw
(c) T-shape (d) Linear

30. Which one of the following atomic or ionic radius is not correct

(a) $I^- > I > I^+$ (b) $\overset{+}{N}a > Mg^{++} > Al^{+3}$

(c) $P^{+5} > P^{+3}$ (d) Li > Be > B

31. The correct order of bond dissociation energy among N_2, O_2, O_2^- is shown in -

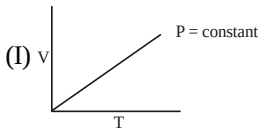
(a) $N_2 > O_2^- > O_2$ (b) $O_2^- > O_2 > N_2$

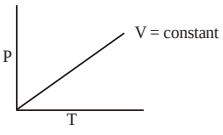
(c) $N_2 > O_2 > O_2^-$ (d) $O_2 > O_2^- > N_2$

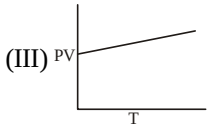
32. A gas has a volume 3.86L at a temperature of 45°C what will be volume of gas, if its temperature is raised to 80°C, while its pressure is kept constant?

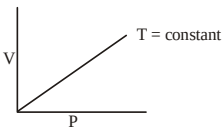
(a) 5.26 L (b) 4.28 L
(c) 6.25 L (d) 3.27 L

33. Which of the following plots are correct

(I) 

(II) 

(III) 

(IV) 

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

34. A compound which is mild antiseptic for skin infection, used in fire extinguishers, used to make cakes or pastries light and fluffy.

(a) Calcium carbonate
(b) K HCO_3
(c) Sodium hydrogen Carbonate
(d) Sodium Carbonate

35. The metal used for blood Co-ogulation is

(a) Ca (b) K (c) Na (d) Mg

36. The commercial name for calcium oxide is

(a) Lime stone (b) Milk of lime
(c) Slaked lime (d) Quick lime

37. Which has minimum hydration enthalpy

(a) Li^+ (b) Al^{+3} (c) Ca^{+2} (d) K^+

38. Which of the following when introduced into the Bunsen's flame gives Apple green colour

(a) NaCl (b) $BaCl_2$ (c) CsCl (d) KCl

39. Equal masses of oxygen and methane mixed in an empty container at 25°C The fraction of total pressure exerted by oxygen

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) $\frac{1}{3} \times \frac{273}{298}$

40. The decreasing order of ionisation enthalpy in KJ/mole are

(a) B > Al > Ga > In > Tl
(b) Tl > In > Ga > Al > B
(c) B > Tl > Ga > In > Al
(d) B > Tl > Ga > Al > In

Maths

41. Let $a_1, a_2, a_3, \ldots, a_n, \ldots$ be in A.P.

If $a_3 + a_7 + a_{11} + a_{15} = 72$, then the sum of its first 17 terms is equal to

(a) 306 (b) 204
(c) 153 (d) 612

ROUGH WORK

42. In a geometric progression consisting of positive terms, each term equals the sum of the next two terms. Then the common ratio of its progression is equals

(a) $\sqrt{5}$ (b) $\frac{1}{2}(\sqrt{5}-1)$

(c) $\frac{1}{2}(1-\sqrt{5})$ (d) $\frac{1}{2}\sqrt{5}$

43. The value of $1^2+3^2+5^2+....+25^2$ is

(a) 2925 (b) 1469
(c) 1728 (d) 1456

44. The sum of the coefficients in the expansion of $(x+y)^n$ is 4096. The greatest coefficient in the expansion is

(a) 1024 (b) 924
(c) 824 (d) 724

45. In the binomial expansion of $(a-b)^n, n \geq 5$, the sum of 5th and 6th terms is zero, then $\frac{a}{b}$ equals :

(a) $\frac{5}{n-4}$ (b) $\frac{6}{n-5}$

(c) $\frac{n-5}{6}$ (d) $\frac{n-4}{5}$

46. The coefficient of x^7 in the expansion of $(1-x-x^2+x^3)^6$ is

(a) 144 (b) -132
(c) -144 (d) 132

47. Total number of four digit odd numbers that can be formed using 0, 1, 2, 3, 5, 7 are

(a) 192 (b) 375
(c) 400 (d) 720

48. How many ways are there to arrange the letters in the word GARDEN with the vowels in alphabetical order?

(a) 120 (b) 240
(c) 360 (d) 480

49. Let T_n denote the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1}-T_n=21$, then n equals

(a) 5 (b) 7
(c) 6 (d) 4

50. The modulus of (1 + i) (1 + 2i) (1 + 3i) is equal to

(a) $\sqrt{10}$ (b) $\sqrt{5}$
(c) 5 (d) 10

51. If z, iz & z + iz are the vertices of a triangle whose area is 2 units then the value of |z| will be

(a) 4 (b) 2
(c) –2 (d) 0

52. If the conjugate of (x + iy) (1 – 2i) be 1 + i then x and y are

(a) 3/5, 4/5 (b) 3/5, 1/5
(c) –3/5, 1/5 (d) none of these

53. If 3 + 4i is a root of the equation $x^2 + px + q = 0$, then

(a) p = 6, q = 25 (b) p = 6, q = 1
(c) p = – 6, q = – 7 (d) p = – 6, q = 25

54. If α, β are the roots of the equation $x^2 - 3x + 1 = 0$, then the equation with roots $\frac{1}{\alpha-2}, \frac{1}{\beta-2}$ will be

(a) $x^2 - x - 1 = 0$ (b) $x^2 + x - 1 = 0$
(c) $x^2 + x + 2 = 0$ (d) none of these

55. If the roots of the quadratic equation $x^2 + px + q = 0$ are $\tan 30^\circ$ and $\tan 15^\circ$, respectively then the value of 2 + q – p is

(a) 3 (b) 0
(c) 1 (d) 2

56. If $a\cos\theta + b\sin\theta = 3$ & $a\sin\theta - b\cos\theta = 4$ then $a^2 + b^2$ has the value =

(a) 25 (b) 14
(c) 7 (d) none

ROUGH WORK

57. If $\cos A = m \cos B$, then

(a) $\cot\frac{A+B}{2}=\frac{m+1}{m-1}\tan\frac{B-A}{2}$

(b) $\tan\frac{A+B}{2}=\frac{m+1}{m-1}\cot\frac{B-A}{2}$

(c) $\cot\frac{A+B}{2}=\frac{m+1}{m-1}\tan\frac{A-B}{2}$

(d) None of these

58. The value of the expression is equal to

$$1-\frac{\sin^2 y}{1+\cos y}+\frac{1+\cos y}{\sin y}-\frac{\sin y}{1-\cos y}$$

(a) –siny (b) siny
(c) cosy (d)–cosy

59. The domain of the function $f(x)=\frac{1}{\sqrt{|x|-x}}$ is

(a) $(0, \infty)$ (b) $(-\infty, 0)$
(c) $(-\infty, \infty)-\{0\}$ (d) $(-\infty, \infty)$

60. The range of the function $f(x)=\frac{1}{2-\sin 3x}$ is

(a) $\left[\frac{1}{3},1\right]$ (b) $\left(\frac{1}{3},1\right)$
(c) $[-1,1]$ (d) $\left(\frac{-1}{3},-1\right)$

G.K.

61. World Health day is observed on?
(a) 3rd April (b) 4th April
(c) 5th April (d) 7th April

62. Which among the following bodies estimates the national income of India?
(a) Office of the Economic Advisor
(b) Ministry of Statistics
(c) Central Statistical Office
(d) Ministry of Finance

63. The right to constitutional remedies allows Indian citizens to stand up for their rights against anybody even the government of India. Which article says this?
(a) Article 31 (b) Article 32
(c) Article 33 (d) Article 34

64. What was the original name of Mirabehn, an associate and disciple of Mahatma Gandhi?
(a) Oliver Schriener
(b) Millie Graham Polock
(c) Madeline Slade
(d) Margarate Cousins

65. For his major role in the development of computer chip 'Pentium', which Indian IT expert is called the `Father of Pentium'?
(a) Ajay Bhatt (b) AnandChandrasekher
(c) VinodDham (d) BiswamohanPani

66. GolGhar, a beehive shaped structure built in 1786 to store grains for the British Army, is located in which city?
(a) Bhopal (b) Patna
(c) Varnas (d) Lucknow

67. What is the name of India's first nuclear reactor?
(a) Cirius (b) Apsara
(c) Dhruva (d) Kamini

68. Mahatama Gandhi had launched his first Satyagraha in India from which among the following places?
(a) Kheda (b) Bardoli
(c) Champaran (d) Sabarmati

69. Which among the following Indian classical dance form was developed by Siddhendra Yogi from Bhamakalapam dance drama ?
(a) Kuchipudi (b) Odissi
(c) Yakshagana (d) Kathkali

ROUGH WORK

70. Which of the following European countries is known as the 'Land of a thousand lakes'?
(a) Norway (b) Sweden
(c) Finland (d) Estonia

71. Stilwell Road" connects India with which among the following neighbors?
(a) China (b) Bhutan
(c) Bangladesh (d) Pakistan

72. Major Dhyanchand's birthday is celebrated as National Sports Day in India, on which among the following dates?
(a) July 29th (b) August 29th
(c) March 29th (d) April 29th

73. The Commonwealth Games started from which among the following countries?
(a) England (b) Australia
(c) Canada (d) India

74. Who among the following had written Bangladesh's national anthem" Amar Sonar Bangla"?
(a) Nazrul Islam (b) Rabindranath Tagore
(c) AnisurRahman (d) SantidevGhosh

75. Which among the following types of glasses contains Cerium and other rare earths and has a high absorption of ultraviolet rays?
(a) Crookes Glass (b) Pyrex Glass
(c) Flint Glass (d) Crown Glass

76. Where are the headquarters of NATO?
(a) New York (b) Brussels
(c) Paris (d) Vienna

77. National Housing Bank is the wholly subsidiary of RBI. In which year, NHB was established?
(a) 1985 (b) 1986
(c) 1987 (d) 1988

78. The Mandal Commission was constituted during the tenure of which among the following prime ministers?
(a) Indira Gandhi (b) Morarji Desai
(c) Rajiv Gandhi (d) V P Singh

79. "The Analects" is a sacred text of which philosopher?
(a) Confucius (b) Hippocrates
(c) Socrates (d) Herodotus

80. Maximum number of animals species belong to which among the following groups?
(a) Mammalia (b) Ayes
(c) Pisces (d) Arthropoda

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ROUGH WORK