PHYSICS

1. A car moving at the speed of 20m s^{-1} along north takes U-turn and its speed increases to 25 m s^{-1} Change in velocity and change in speed during turn are respectively
   (a) 5m s^{-1} 5m s^{-1}
   (b) 45m s^{-1} 45m s^{-1}
   (c) 45m s^{-1} 0.5m s^{-1}
   (d) 5m s^{-1} 45 ms^{-1}

2. The expression for the motion of an object is given as x(t) = 0.08t^3 The average velocity of the object between t = 3 s and t = 5.0 s is
   (a) 3.92m s^{-1}
   (b) 3.86m s^{-1}
   (c) 3.845m s^{-1}
   (d) 3.82m s^{-1}

3. An object moves along the x-axis in such a way that its x-coordinates varies with time as x = 2 - 5t + 6t^2. What will be its initial velocity?
   (a) 5 m/s
   (b) - 5m / s
   (c) 2 m/s
   (d) - 2m / s

4. Position of a particle moving along x-axis is given by x = t^2 - 2t + 4. Displacement of the particle when velocity becomes zero is
   (a) -6 m
   (b) -1m
   (c) 6 m
   (d) 1 m

5. A particle moves with a velocity v(t) = (1/2) kt^2 along a straight line. Find the average velocity of the particle in time T
   (a) kT^2
   (b) 1/6 kT^2
   (c) kT
   (d) 7k

6. Velocity of a particle is given by v = 2x². What is its average velocity as the particle travels from x$_1$ = 1 m to x$_2$ = 2 m?
   (a) 4/2 m s^{-1}
   (b) 4m s^{-1}
   (c) 1m s^{-1}
   (d) 14/3 m s^{-1}

7. A particle moves along a straight line with a velocity given by v = (2t - 6) where v is in m/s and t is the time in second. Distance travelled by particle in first 4 s is
   (a) 0 m
   (b) -8 m
   (c) 10 m
   (d) 2 m

8. Velocity of a particle is given by v = 4x³. Average velocity of the particle averaged over displacement as it travels from x$_1$ = 1 m to x$_2$ = 3 m is
   (a) 40 m s^{-1}
   (b) 20 m s^{-1}
   (c) 30 m s^{-1}
   (4) 50 m s^{-1}

9. The position of a particle is given by x = 40 - 5t - 5t² where x is in metre and t is in second. Its average acceleration between 1s and 2 s is
   (a) 10 ms²
   (b) -10 m s^{-2}
   (c) 20 m s^{-2}
   (d) -20 m s^{-2}

10. The relation 3t = $\sqrt{3x}$ + 6 describes the displacement of a particle in one direction, where x is in metres and t in second. The displacement when velocity is zero is
    (a) 24 m
    (b) 12 m
    (c) 5m
    (d) Zero

11. A body travels for 15 s starting from rest with constant acceleration. If it travels distances S$_1$, S$_2$, and S$_3$ in the first five seconds, second five seconds and next seconds, respectively, the relation between S$_1$ S$_2$ and S$_3$, is
    (a) S$_1$ = S$_2$ = S$_3$
    (b) 5S$_1$ = 3S$_2$ = S$_3$
    (c) S$_1$ = 1/3 S$_2$ = 1/5 S$_3$
    (d) S$_1$ = 1/5 S$_2$ = 1/3S$_3$

12. The displacement of a particle is given y = a + bt + ct^2 –dt^4. The initial velocity and acceleration are respectively
    (a) b, - 4d
    (b) - b, - 2c
    (c) b, 2c
    (d) 2c, - 4d

13. A car, starting from rest, is accelerated at a constant rate α until it attains a speed v. It is then retarded at a constant rate β until it comes to rest. The average speed of the car during its entire journey is
    (a) zero
    (b) αv /2β
    (c) βv/2α
    (d) v/2

14. Which of the following represents uniformly accelerated motion?
    (a) x= $\sqrt{\frac{t+a}{b}}$
    (b) x = $\frac{t+a}{b}$
    (c) t= $\sqrt{\frac{t+a}{b}}$
    (d) x = $\sqrt{t+a}$

15. In the given v-t graph the distance travelled by the body in 5s will be

(a) 20m   (b) 40 m
(c) 80m   (d) 100

16. For motion of a particle, acceleration- time graph is shown in figure .The velocity –time curve for the duration of 0 to 4s is
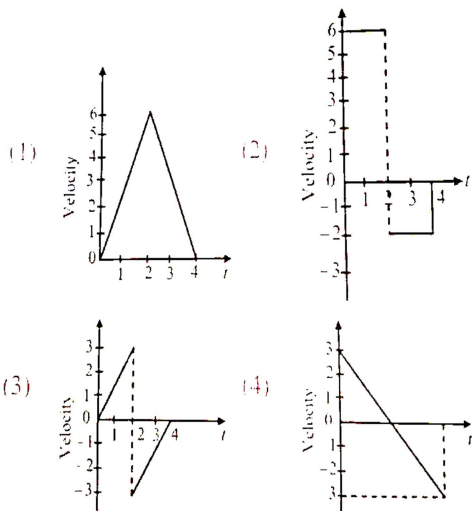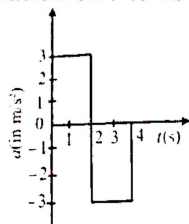

17. Among the four graphs there is only one graph for which average velocity over the time interval (0,T) can vanish for a suitable chosen T. Which one is it?
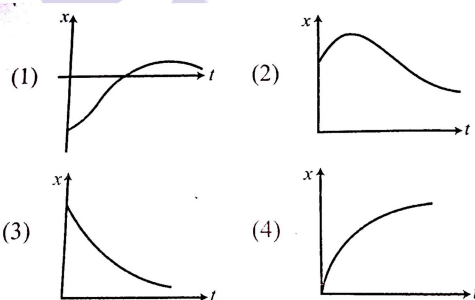
18. A stone is dropped into a well in which the level of water is h below the top of the well . If v is velocity of sound , the time T after which the splash is heard is given by

(a) $T = \frac{2h}{v}$ (b) $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$

(c) $T = \sqrt{\frac{2h}{v}} + \frac{h}{g}$ (d) $T = \sqrt{\frac{h}{2g}} + \frac{2h}{v}$

19. Speed –time graph of two cars A and B approaching towards each other is shown in the figure . Initial distance between them is 60 m. The two cars will cross each other after time
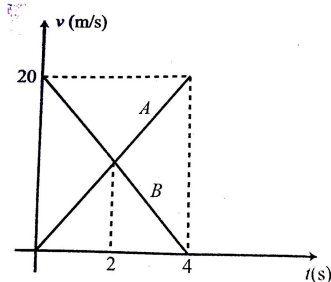
(a) 2s   (b) 3s
(c) 1.5 s   (d) $\sqrt{2}s$

20. A body is projected with u velocity a. It passes through a certain point above the ground after t_1 second. The time interval after which the body passes through the same point during the return journey is

(a) $\left(\frac{u}{g} - t_1^2\right)$ (b) $2\left(\frac{u}{g} - t_1\right)$

(c) $\left(\frac{u}{g} - t_1\right)$ (d) $\left(\frac{u^2}{g^2} - t_1\right)$

21. A stone is thrown vertically upward with initial velocity v_0.The distance travelled in time $\frac{1.5v_0}{g}$ is

(a) $\frac{v_0^2}{2g}$ (b) $\frac{3v_0^2}{8g}$

(c) $\frac{5v_0^2}{8g}$ (d) none of these

22. A ball is thrown vertically upwards from the top of a tower with a velocity of 10 m/s. If the ball falls on the ground after 5s, the height of the tower will be
(a) 25 m   (b) 50 m
(c) 75 m   (d) 100 m

23. A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to height d/2. Neglecting subsequent motion and air resistance, its velocity v varies with height h above the ground as
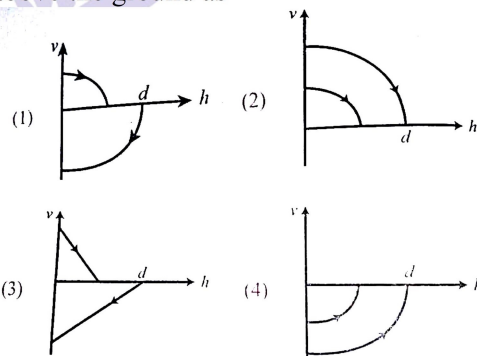
24. A particle projected vertically upwards returns to the ground in time T. Which graph represents the correct variation of velocity (v) against time (t)?

(1) (2) (3) (4)
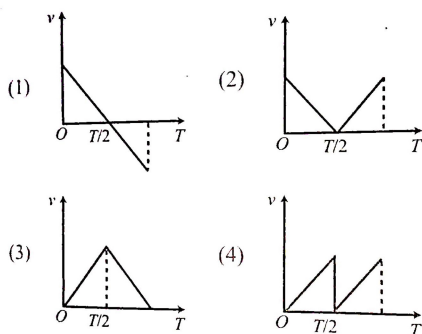
25. Which of the following graph correctly represents velocity –time relationship for a particle released from rest to fall freely under gravity?
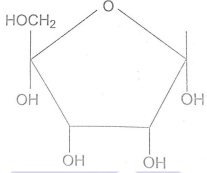

(1) (2) (3) (4)
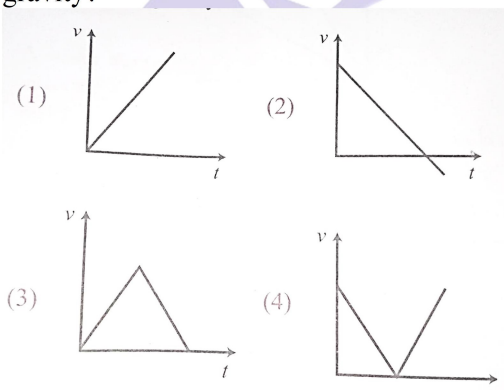
CHEMISTRY

26. The ratio of charge and mass would be greater for
   (a) Proton
   (b) Electron
   (c) Neutron
   (d) Alpha

27. The radius of an atom is of the order of
   (a) 10^{-10} cm
   (b) 10^{-13} cm
   (c) 10^{-15} cm
   (4) 10^{-8} cm

28. Which one of the following pairs is not correctly matched?
   (a) Rutherford: Proton
   (b) JJ Thomson: Electron
   (c) JH.Chadwick Neutron
   (d) Bohr: Isotope

29. Which of the following is wrong?
   (a) Cathode rays have constant e/m ratio
   (b) e/m ratio of anode rays is not constant
   (c) e/m ratio of protons is not constant
   (d) e/m ratio of β-particles is constant

30. The number of electrons in one molecule of CO_2 are
   (a) 22
   (b) 44
   (c) 66
   (d) 88

31. An atom has 26 electrons and its atomic weight is 56. The number of neutrons in the nucleus of the atom will be
   (a) 26
   (b) 30
   (c) 36
   (d) 56

32. Which of the following particles has more electrons than neutrons?
   (a) C
   (b) F⁻
   (c) O^{-2}
   (d) Al^{+3}

33. Which of the following statement is incorrect in Rutherford's experiment?
   (a) inside the atom there is a heavy positive centre
   (b) nucleus contains protons and neutrons
   (c) most of the space in an atom is empty
   (d) size of nucleus is very small

34. The number of neutrons in tritium is
   (a) 1
   (b) 2
   (c) 3
   (d) 0

35. Rutherford's experiment on scattering of a particles showed for the first time that the atom has
   (a) Electrons
   (b) Protons
   (c) Nucleus
   (d) Neutrons

36. Rutherford's scattering experiment is related to the size of the
   (a) Nucleus
   (b) Atom
   (c) Electron
   (d) Neutron

37. When alpha particles are sent through a thin metal foil, most of them go straight through the foil because
   (a) Alpha particles are much heavier than electron
   (b) Alpha particles are positively charged
   (c) Alpha particles move with high velocity
   (d) Most part of the atom is empty

38. The triad of nuclei which is isotonic is
   (a) $_6C^{14}$, $_7N^{15}$, $_9F^{17}$
   (b) $_6C^{14}$, $_7C^{14}$, $_9F^{19}$
   (c) $_6C^{14}$, $_7N^{14}$, $_9F^{17}$
   (d) $_6C^{14}$, $_7N^{14}$, $_9F^{19}$

39. The value of Planck's constant is
   (a) 6.6256×10^{-27} erg s
   (b) 66.256×10^{-27} erg s
   (c) 6.02×10^{-15} erg s
   (d) 3.01×10^{-23} erg s.

40. According to photoelectric effect, the kinetic energy of the ejected electrons is directly proportional to
   (a) Wavelength of light
   (b) Intensity of light
   (c) Frequency of light
   (d) Velocity of incident radiation

41. Ratio of the energy of a photon with wavelengths 3000 Å and 6000 Å is
   (a) 1:3
   (b) 1:2
   (c) 2:1
   (d) 1:6

42. Calculate the number of photons of light of wavelength 3960 Å necessary to provide 1 J of energy.
   (a) 2×10^{20}
   (b) 2×10^{16}

(c) 2×10^{13} (d) 2×10^{18}

43. A wavelength of 400 nm corresponds to
    (a) frequency (v) = 7.5×10^{14} Hz
    (b) wave number ($\bar{v}$)= 2.5×10^{6} m^{-1}
    (c) momentum (mv) = 1.66×10^{-27} kg ms^{-1}
    (d) All of the above

44. The energy of a photon is calculated by
    (a) E = h v (b) h = Ev
    (c) h = E/v (d) E = h/v

45. Select the incorrect statement(s).
    (a) Electromagnetic radiation is a form of energy consisting of oscillating electric field only.
    (b) Visible light is a form of electromagnetic radiation.
    (c) The electromagnetic spectrum of sunlight received at the Earth's surface differs from that emitted by the Sun.
    (d) Cathode rays travel from anode (source) to cathode.

46. Given.
    (I) Radiations for microwave oven
    (II) Amber light from traffic signals
    (III) Radiations from FM radio
    (IV) Cosmic rays from outer space
    (V) X-rays
    Increasing order of their energies is
    (a) I < II < III < IV < V
    (b) V < IV < III < II < I
    (c) I < III < V < IV < II
    (d) III < I < II < V < IV

47. The longest wavelength of light capable of breaking a single (Cl - Cl) bond in Cl_2 is
    [Given, Cl-Cl(g) → 2Cl(g); ΔH = 242kJ Mol^{-1}]
    (a) 494 pm   (2) 494 nm
    (c) 494 Å   (d) 247 nm

48. The work function of a metal is 4.2 eV If radiations of 2000Å fall on the metal, then the kinetic energy of the fastest photoelectron is
    (a) 1.6×10^{-19} J   (2) 16×10^{-10} J
    (c) 3.2×10^{-19} J   (4) 6.4×10^{-10} J

49. Light of wavelength 5000 Å falls on a metal surface of work function 1.9 eV.
    The kinetic energy of photoelectrons is
    (a) 9.3×10^{-20} J   (b) 7.2×10^{-14} J
    (c) 6.8×10^{-14} J   (d) 2.5×10^{-13} J

50. The velocity of electron ejected from a platinum surface when radiation of 200 nm falls on it. The work function of platinum is 5 eV (1eV = 1.6×10^{-19} J)
    (a) 7×10^{6} m s^{-1} (b) 3.8×10^{5} m s^{-1}
    (c) 2.6×10^{5} ms^{-1} (4) 6.54×10^{5} m s^{-1}

BIOLOGY

51. Which of the following secondary metabolites is a polymeric substance?
    (a) Ricin   (b) Monoterpenes
    (c) Curcumin   (d) Rubber

52. The given structure represents a monosaccharide known as

    (a) Ribose   (b) Glucose
    (c) Fructose   (d) Raffinose

53. Which one is a disaccharide?
    (a) Sucrose   (b) Glucose
    (c) Fructose   (d) Galactose

54. Smallest polysaccharide is
    (a) Starch   (b) Inulin
    (c) Glycogen   (d) Cellulose

55. Glycoproteins contain
    (a) Protein and fat
    (b) Protein and salt
    (c) Protein and vitamin
    (d) Protein and carbohydrates

56. Which of the following is polymerized to form proteins?
    (a) Protein   (b) Carbohydrates
    (c) Amino acid   (d) Muramic acid

57. The amino acids in a protein are held together by
    (a) Glycosidic bond
    (b) Phosphodiester bond
    (c) Peptide bond   (d) Hydrogen bond

58. β-pleated sheets occur where there are
    (a) Two or more polypeptide chains
    (b) Both a-helix and B-pleated occur in the same polypeptide
    (c) Four polypeptide chains present
    (d) None of these

59. Collagen is
    (a) Carbohydrate   (b) Lipid
    (c) Fibrous protein   (d) Globular protein

60. Cholesterol is a
    (a) Phospholipid   (b) Wax
    (c) Steroid   (d) Triglyceride

61. The cholesterol molecule is
    (a) An aromatic ring   (b) A tocopherol
    (c) A straight chain acid (d) A sterol

62. Lecithin is
    (a) Simple lipid   (b) Derived lipid
    (c) Phospholipid   (d) Steroids

63. Cytidine is a
    (a) Purine   (b) Pyrimidine
    (c) Nucleoside   (d) Nucleotide

64. Pyrimidines of RNA are

(a) Uracil and Cytosine
(b) Uracil and Thymine
(c) Adenine and Guanine
(d) Cytosine and Thymine

(a) Adenine and guanine
(b) Sugar-phosphate sugar chain
(c) Cytosine and thymine
(d) All of these

65. In double helix model of DNA, the number of hydrogen bonds formed between guanine and cytosine is
(a)Two   (b) One
(c) Three   (d) Four

66. On hydrolysis a nucleoside would not yield
(a) Phosphoric acid   (b) Purine
(c) Pyrimidine   (d) Pentose sugar

67. Chargafl, in his experiments on the chemistry of DNA, estimated the base composition of human DNA and found Adenine constitute 31% and Guanine 19% The quantity of cytosine in the DNA of a human somatic cell is likely to be
(a) 31%   (b) 19%
(c) 62%   (d) 38%

68. In enzymes, value of k_m constant indicates
(a)Substrate concentration at which the chemical reaction catalyzed by an enzyme attains half of its maximum velocity
(b) Enzyme concentration at which the enzymatic reaction attains half its maximum velocity
(c) Affinity of the enzyme for its substrate
(d) Both (a) and (c)

69. Enzyme having a non-protein prosthetic group attached to it is called
(a) Apoenzyme   (b) Holoenzyme
(c) Co-enzyme   (d) Protoenzyme

70. The protein part of an enzyme is
(a) Prosthetic group   (b) Apoenzyme
(c) Holoenzyme   (d) Zymogen

71. Coenzyme is
(a) Always protein   (b) Often metal
(c) Inorganic compound
(d) Often a vitamin

72. Living organisms have many elements that are present either in free state or in the form of compounds. Which element is not found in living organisms?
(a) Magnesium   (b) Silicon
(c) Iron   (d) Sodium

73. Unbranched polymer of glucose is
(a) Starch   (b) Glycogen
(c) Cellulose   (d) Chitin

74. In DNA molecule, which of the following base pair is present?
(a) Cytosine and adenine
(b) Adenine and thymine
(c) Adenine and guanine
(d) Cytosine and thymine

75. The backbone of a DNA molecule is made up of