101 PC06

ROLL No. | | | | | | QN. BOOKLET No. 07221

TEST FOR FIRST DEGREE PROGRAMMES IN ENGINEERING AND TECHNOLOGY

PHYSICS AND CHEMISTRY

Time: 1½ Hours Maximum Marks: 375

INSTRUCTIONS TO CANDIDATES

1. You are provided with a Question booklet and an Optical Mark Reader (OMR) Answer Sheet to mark your responses. Do not soil your OMR Sheet. Read carefully all the instructions given on the OMR Sheet.

2. Write your Roll Number in the space provided for on the top of this page.

3. Also write your Roll Number, Examination Centre, Subject name and the date and time of the examination in the columns provided for the same on the Answer Sheet and write your Roll Number and Centre Code in the boxes provided for the same.

4. The paper consists of 125 objective type questions, out of which the first 75 questions are from Physics and the remaining 50 questions are from Chemistry. All questions carry equal marks.

5. Each question has four alternative responses marked **A, B, C** and **D** and you have to **darken** the bubble fully corresponding to the correct response as indicated in the example shown on the Answer Sheet. Use **HB Pencil** to mark your choices on the Answer Sheet

6. Each correct answer carries **3** marks and each wrong answer carries **1** minus mark.

7. Please do your rough work only on the space provided for it at the end of this question booklet.

8. You should return the Question Booklet and the Answer Sheet to the Invigilator before you leave the examination hall.

9. Every precaution has been taken to avoid errors in the Question Booklet. In the event of such unforeseen happenings, suitable remedial measures will be taken at the time of evaluation.

10. Please feel comfortable and relaxed. You can do better in this test in a tension-free disposition.

WISH YOU A SUCCESSFUL PERFORMANCE

1. Spotting a police car, you brake a fiat from a speed of 100 *km/h* to a speed of 80.0 *km/h* during a displacement of 88.0 *m* at constant acceleration. What is the acceleration?

(A) $1.85\ m/s^2$. (B) $1.815\ m/s^2$.
(C) $-1.58\ m/s^2$. (D) $1.58\ m/s^2$.

2. A light particle moving horizontally with a speed of 12 *m/s* strikes a very heavy block moving in the same direction at 10 *m/s*. The collision is one-dimension and elastic. After the collision, the particle will -

(A) move at 2 *m/s* in its original direction.
(B) move at -8 *m/s* in its original direction.
(C) move at -8 *m/s* in opposite to its original direction.
(D) move at 12 *m/s* in opposite to its original direction.

3. A ball falls from a height '*h*' on a floor and rebounds to a height *h*/4. The coefficient of restitution between the ball and the floor is -

(A) $\frac{1}{\sqrt{2}}$. (B) $\frac{1}{2}$.
(C) $\frac{1}{4}$. (D) $\frac{3}{4}$.

4. A constant horizontal force $\vec{F}_{ap}$ of magnitude 20*N* is applied to block *A* of mass = 40 *kg*, which pushes against block *B* of mass = 6.0 *kg*. The blocks slide over a frictionless surface along an x-axis. What is the acceleration of blocks?

(A) $20\ m/s^2$. (B) $0.2\ m/s^2$.
(C) $2.0\ m/s^2$. (D) $200\ m/s^2$.

5. Escape velocity of a particle is given by -

(A) $v = \sqrt{(R/2Gm)}$. (B) $1/v = \sqrt{(R/2Gm)}$.
(C) $v = \sqrt{(2GR^2/m)}$. (D) $v = \sqrt{(2Gm/R^3)}$.

6. How much heat must be absorbed by ice of mass $m = 720g$ at $-10^{\circ}C$ to take it to liquid state at $15^{\circ}C$?

(A) 400 *kJ*. (B) 300 *kJ*.
(C) 800 *kJ*. (D) 250 *kJ*.

7. What is the mean free path for oxygen molecules at temperature $T = 300K$ and pressure $P = 1.0\ atm$? Assume molecular diameter $d = 290\ pm$ and the gas is ideal.

(A) $1.1 \times 10^{-7} m$. (B) $1.1 \times 10^{-6} m$.
(C) $1.1 \times 10^{-8} m$. (D) $1.1 \times 10^{7} m$

8. Find the mass in Kilograms of 7.50×10^{22} atoms of arsenic which has a molar mass of 74.9 *gm/mol*.

(A) 0.933 *kg*. (B) 9.33 *kg*.
(C) 93.3 *kg*. (D) 933 *kg*.

9. A spherical black body with a radius of $12cm$ radiates $450w$ power at $500K$. If the radius were halved and the temperature doubled, the power radiated in Watts would be -

(A) 225. (B) 450.
(C) 900. (D) 1800.

10. Twelve electrons, of charge $-e$ are equally spaced and fixed around a circle of radius R. Relative to $V = 0$ at infinity, what is the electric potential at the centre of the circle due to these electrons?

(A) $-1/2(1/4\pi\varepsilon_0)(e/R)$. (B) $-1/6(1/4\pi\varepsilon_0)(e/R)$.
(C) $-1/24(1/4\pi\varepsilon_0)(e/R)$. (D) $-12(1/4\pi\varepsilon_0)(e/R)$.

11. A particular $12V$ car battery can send a total charge of 84 $A.hr$ through a circuit from one terminal to the other. How many coulombs of charge does this represent?

(A) $3 \times 10^{6} C$. (B) $3 \times 10^{4} C$.
(C) $3 \times 10^{3} C$. (D) $3 \times 10^{5} C$.

12. Capacitor 1 with $C_1 = 3.55\mu F$ charged to a potential difference $V_0 = 6.30V$ using a battery is then removed and connected to an uncharged capacitor $C_2 = 8.95\mu F$. After some time, both capacitors will have the same potential V. Find V?

(A) 2.79 *V*. (B) 1.79 *V*.
(C) 3.79 *V*. (D) 4.79 *V*.

13. A gas at absolute temperature $300K$ has pressure $P = 4 \times 10^{-10} \mathrm{N/m^2}$. Boltzmann constant $k = 1.38 \times 10^{-23}\ J/K$. The number of molecules per cm^3 is of the order of -

(A) 100. (B) 10^5.
(C) 10^8. (D) 10^{11}.

14. A particle of charge $q_1 = +8q$ at the origin and a particle of charge $q_2 = -2q$ at $X = L$. At what point can a proton be placed so that it is in equilibrium?

(A) $3\,L$. (B) $4\,L$.
(C) $2\,L$. (D) $5\,L$.

15. What is the magnitude of the repulsive electrostatic force between two protons that are separated by $4.0 \times 10^{-15} m$?

(A) $10\,N$. (B) $14\,N$.
(C) $2\,N$. (D) $13\,N$.

16. What is the total charge in coulombs of 75.0 kg of electrons?

(A) $1.32 \times 10^{13} C$. (B) $-1.32 \times 10^{13} C$.
(C) $-1.32 \times 10^{15} C$. (D) $-1.32 \times 10^{14} C$.

17. A parallel-plate capacitor whose capacitance C is 13.5 pF is charged by a battery to a potential difference $V = 12.5\ V$ between its plates. The charging battery is now disconnected and a porcelain slab ($k = 6.50$) is slipped between the plates. What is the potential energy of the capacitor slab device after the slab is put into plates?

(A) $170\,pJ$. (B) $140\,pJ$.
(C) $160\,pJ$. (D) $200\,pJ$.

18. A capacitor of capacitance C is discharging through a resistor of resistance R. In terms of time constant $\tau = RC$, when will the charge on the capacitor be half its initial value?

(A) $0.69\,\tau$. (B) $6.9\,\tau$.
(C) $69\,\tau$. (D) $0.069\,\tau$.

19. Nine Copper wires of length "L" and diameter "d" are connected in parallel to form a single composite conductor of resistance "R". What must be the diameter "d" of the single Copper wire of length "L" if it is to have the same resistance?

(A) $9\,d$. (B) $6\,d$.
(C) $12\,d$. (D) $3\,d$.

20. A 15.0 $k\Omega$ resistor and a capacitor are connected in series and then a 12.0 V potential difference is suddenly applied across them. The potential difference across the capacitor rises to 5.0 V in 1.30 $\mu\,s$. Calculate the time constant.

(A) $2.41\ \mu\,s$. (B) $3.41\ \mu\,s$.
(C) $3.51\ \mu\,s$. (D) $3.71\ \mu\,s$.

21. An electron with a kinetic energy of 22.5 eV moves into a region with uniform magnetic field B of magnitude $4.55 \times 10^{-4} T$. The angle between the direction of B and the electron's velocity V is 65.5°. What is the pitch of the helical path taken by the electron?

(A) 10.2 *cm.* (B) 91.12 *cm.*
(C) 19.3 *cm.* (D) 9.16 *cm.*

22. A proton travelling at 23.0° with respect to the direction of a magnetic field of strength 2.60 mT experiences a magnetic force of $6.50 \times 10^{-17} N$. Calculate the proton speed.

(A) 400 *km/s.* (B) 350 *km/s.*
(C) 450 *km/s.* (D) 410 *km/s.*

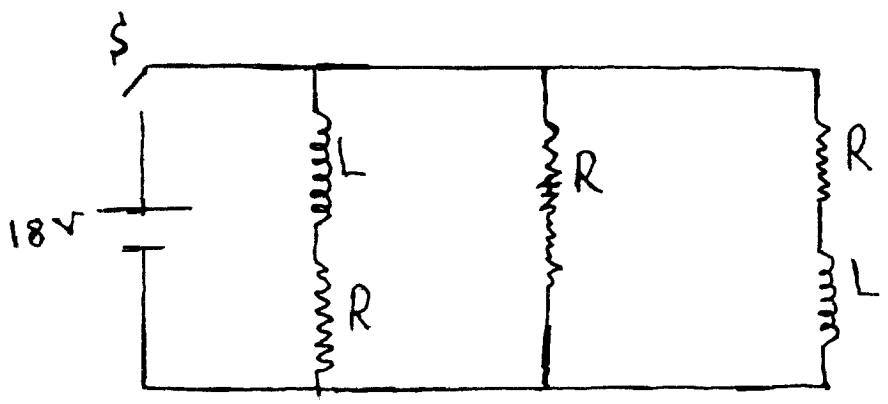
23. In a nuclear experiment a proton with kinetic energy 1.0 MeV moves in a circular path in a uniform magnetic field. What is the energy of alpha particle ($q = +2e$: $m = 4.0\ U$) if they are to circulate in the same circular path?

(A) 0.5 *MeV.* (B) 0.75 *MeV.*
(C) 0.25 *MeV.* (D) 1.2 *MeV.*

24. A solenoid has length $L = 1.23\ m$ and inner diameter $d = 3.55\ cm$ and it carries a current $i = 5.57\ A$. It consists of five close-packed layers, each with 850 turns along length L. What is B at its centre?

(A) 22.2 *mT.* (B) 23.2 *mT.*
(C) 24.2 *mT.* (D) 25.2 *mT.*

25.



A circuit with two identical inductors $L = 2.0\ mH$ and three identical resistors $R = 9\,\Omega$ are connected with a battery 18 V as in the figure above. What is the current "i" through the battery just after the switch is closed?

(A) 2.5 *Amp.* (B) 2.0 *Amp.*
(C) 2.1 *Amp.* (D) 2.7 *Amp.*

26. A solenoid has an inductance of 53 *mH* and a resistance of 0.37 Ω. If it is connected to a battery, how long will the current take to reach half its final equilibrium value?

(A) 5 *s*. (B) 6 *s*.
(C) 0.5 *s*. (D) 0.1 *s*.

27. A moth at about eye level is 10*cm* in front of a plane mirror, you are behind the moth, 30*cm* from the mirror. What is the distance between your eyes and the apparent position of the moth's image in the mirror?

(A) 40 *cm*. (B) 4.0 *cm*.
(C) 20 *cm*. (D) 0.4 *cm*.

28. An object is 20 *cm* to the left of a thin diverging lens having 30 *cm* focal length. What is the image distance?

(A) 12 *cm*. (B) 1.2 *cm*.
(C) -1.2 *cm*. (D) -12 *cm*.

29. A double-convex lens is to be made of glass with an index of refraction of 1.5. One surface is to have twice the radius of curvature of the other and the focal length is to be 60 *mm*. What are the radii?

(A) 45 *mm*, 90 *mm*. (B) 25 *mm*, 50 *mm*
(C) 20 *mm*, 40 *mm*. (D) 30 *mm*, 60 *mm*.

30. Two light waves, represented by rays, have wavelength 550.0 nm before entering media 1 and 2. They also have equal amplitude and are in phase. Medium 1is air and medium 2 is transparent plastic refractive index 1.600 and thickness 2.6 μm. What is the phase difference in radians?

(A) 17.3 rad. (B) 13.8 rad.
(C) 17.8 rad. (D) 18.7 rad.

31. The corresponding wavelength range for frequency range 7.5 *MHz* to 12 *MHz* is -

(A) 400 *m* to 250 *m*. (B) 40 *m* to 25 *m*.
(C) 0.4 *m* to 0.25 *m*. (D) 4 *m* to 0. 25 *m*.

32. The distance between coherent sources is 0.2 *mm* and the interference pattern is observed on a screen 0.8 *m* from the sources. If the wavelength of light is 6000 A^{o}, the distance of the second bright and second dark fringe from the central bright fringe are -

(A) 0.48 *m* ; 0.36 *m*.
(B) 48 *mm* ; 0.36 *mm*.
(C) $0.48 \times 10^{-2} m$; $0.36 \times 10^{-2} m$.
(D) $0.28 \times 10^{-2} m$; $0.18 \times 10^{-2} m$.

33. The spectrum obtained by passing white light through iodine vapour or dilute solution of blood is a -

(A) band absorption spectrum.
(B) continuous absorption spectrum.
(C) continuous emission spectrum.
(D) line absorption spectrum.

34. The moment of a short magnet is $4\pi \times 10^{-7} Wb\text{-}m$. At what point on its axial line does the intensity of the field become $10^{3} / 4\pi$ Newton/Weber? ($\mu_o = 4\pi \times 10^{-7} H/m$)

(A) 12.6 *m*.
(B) 1.26 *m*.
(C) 0.126 *m*.
(D) 126 *m*.

35. A deflection magnetometer is used in both Tan *A* and Tan *B* portions. A small bar magnet is used in the same distances from the centre of the needle producing deflections θ_1 and θ_2 of the needle respectively in the two cases. Then -

(A) $2\theta_1 = \theta_2$.
(B) Tan θ_1 = 2Tan θ_2.
(C) 2Tan θ_1 = Tan θ_2.
(D) Tan θ_1/θ_2 = 1/2.

36. The relative permeability of a substance *A* is slightly greater than unity, while that of a substance *B* is slightly less than unity. Then -

(A) *A* is diamagnetic and *B* is paramagnetic.
(B) *A* is paramagnetic and *B* is paramagnetic.
(C) *A* is paramagnetic and *B* is diamagnetic.
(D) Both *A* and *B* are ferromagnetic.

37. The wavelength of an electron which is moving at a speed of $10^{7} m/s$ is -

(A) $1.84 \times 10^{-11} m$.
(B) $6.44 \times 10^{-10} m$
(C) $5.43 \times 10^{-11} m$.
(D) $7.28 \times 10^{-11} m$.

38. The Bain bridge mass spectrometer is used to find out -

(A) mass of the electron.
(B) specific charge of an electron.
(C) the number of isotopes an element has.
(D) the rate of disintegration of radioactive element.

39. The potential energy of an electron in an electric potential 50 V is -

(A) $8 \times 10^{-19} J$.
(B) $80 \times 10^{-19} J$.
(C) $800 \times 10^{-19} J$.
(D) $0.8 \times 10^{-19} J$.

40. The equivalent capacitance when 'n' number of some capacitances is connected in series is equal to -

(A) 'n' times the capacitive value of a single capacitance.
(B) the capacitive value of single capacitance.
(C) $1/n$ times the capacitive value of single capacitance.
(D) square of the capacitive value of single capacitance.

41. The time taken by a radioactive sample to disintegrate 87.5% of its original is 30 hours. Calculate its mean life.

(A) 12.4 hours.
(B) 11.4 hours.
(C) 18.4 hours.
(D) 14.4 hours.

42. An aeroplane is moving north horizontally with a speed of 200 m/s at a place where the vertical component of earth's field is $0.5 \times 10^{-4} T$. The induced *emf* setup between the tips of wings 10 m apart will be -

(A) 0.01 V.
(B) 5 V.
(C) $5 \times 10^{-3} V$.
(D) 0.1 V.

43. Nuclear force arrives due to exchange of -

(A) Baryons.
(B) Leptons.
(C) Mesons.
(D) Photons.

44. The ratio of the 4^{th} and 2^{nd} orbit of Hydrogen atom is -

(A) 0.25
(B) 0.5
(C) 2
(D) 4

45. The radio-active salt used to check the effective functioning of heart is -

(A) Cobalt-60.
(B) Iodine-131.
(C) Sodium-24.
(D) Phosphorous.

46. Which group of particles has their masses in descending order?

(A) Photons, electron, proton, neutron.
(B) Neutron, proton, electron, photon.
(C) Neutron, photon, proton, electron.
(D) Electron, proton, photon, neutron.

47. ${}_{92}U^{238}$ emits 6α particles, 4β particles and 6γ rays. The final product is -

(A) ${}_{84}Po^{214}$ (B) ${}_{82}Pb^{214}$

(C) ${}_{83}Bi^{214}$ (D) ${}_{80}Hg^{214}$

48. For two stages RC coupled amplifier in high frequency range, as the frequency was increased, the gain -

(A) increases. (B) decreases.
(C) remains constant. (D) increases and decreases.

49. Which is a non-sinusoidal oscillation?

(A) Hartley oscillation. (B) Colpit oscillation.
(C) Tuned Base oscillation. (D) Multi vibrators.

50. With a negative feedback, an amplifier gives an output of 10 *V* with an input of 0.5 *V*. When feedback is removed, it requires 0.25 *V* input for the same output, then the gain without feedback is -

(A) 40. (B) 50.
(C) 60. (D) 70.

51. A 10 *V* battery is connected to 50Ω resistance coil. The heat energy produced in one hour is -

(A) 500 *J*. (B) 5 *J*.
(C) 2700 *J*. (D) 7200 *J*.

52. For a thermo couple the temperature of inversion and neutral temperatures are $720^{\circ}C$ and $480^{\circ}C$ respectively. The temperature of the cold junction is -

(A) $480^{\circ}C$. (B) $720^{\circ}C$.
(C) $240^{\circ}C$. (D) $220^{\circ}C$

53. A rectangular coil of 100 turns having a size of 4.2 *cm* × 2.5 *cm* rotating with a frequency of 50 *Hz* in a uniform magnetic field of $4 \times 10^{-5}T$. The maximum value of induced *emf* in the coil is -

(A) 1.25 *mV*. (B) 1.32 *mV*.
(C) 1.16 *mV*. (D) 1.48 *mV*.

54. If the angle between first order images on both sides of central image in a grating having 8000 *lines/cm* is 60°, find the wavelength of light.

(A) 6220 A°. (B) 2650 A°.
(C) 5250 A°. (D) 6250 A°.

55. Statement: In comic rays only particles moving with very high velocities reach the equator.
Reason: The charged particle arriving in the direction experiences a high attractive force.

(A) Statement and reason are correct.
(B) Statement is correct and reason is wrong.
(C) Statement and reason are wrong.
(D) Statement is wrong and reason is correct.

56. Quantum theory supports -

(A) Tyndal effect. (B) Seebeck effect.
(C) Doppler effect. (D) Raman effect.

57. If the wavelength of a light is reduced to half, then the amount of scattering is -

(A) increased by 2 times. (B) decreased by 16 times.
(C) increased by 16 times. (D) decreased by 4 times.

58. The nuclear force between any two nucleons arise due to -

(A) spin exchange interaction of pions.
(B) exchange of positrons.
(C) continuous exchange of mesons.
(D) periodic exchange of baryons.

59. The electric main in a house is marked to 220 *V*, 50 *Hz*. The equation for instantaneous voltage is -

(A) 310 Sin 100 πt. (B) 220 Sin 100πt.
(C) 220 Sin 50πt. (D) 200 Sin 100πt.

60. The frequency of a man's voice is 300 *Hz* and the wavelength 3 *metres*. At the same place if a child utters a voice with a frequency of 100 *Hz*, the wavelength of the child's voice is -

(A) 3 *metres*. (B) 6 *metres*.
(C) 9 *metres*. (D) 12 *metres*.

61. An Atwood's machine with masses m_1 and m_2 connected by a string on the two sides of a pulley can give an acceleration equal to -

(A) $\frac{m_1}{m_2} g$.

(B) $\frac{m_2}{m_1} g$.

(C) $\frac{(m_1 - m_2)}{(m_1 + m_2)} g$.

(D) $\frac{(m_1 + m_2)}{(m_1 - m_2)} g$.

62. Rocket works on the principle of conservation of -

(A) energy.
(B) linear momentum.
(C) angular momentum.
(D) energy and impulse.

63. Which one of the following has the same dimension as that of pressure?

(A) Strain.
(B) Elasticity.
(C) Stress.
(D) Buoyancy.

64. Boyles law is a change of variables of the equation of states dealing P, V, T at -

(A) constant temperature.
(B) constant volume.
(C) constant pressure.
(D) constant volume and pressure.

65. The physical property deciding the nature of flow of fluids is -

(A) surface tension.
(B) viscosity.
(C) buoyancy.
(D) density.

66. Which of the following differential equation represents the motion of a damped oscillator?

(A) $\frac{d^2y}{dt^2} + w^2 y = 0$

(B) $\frac{d^2y}{dt^2} - w^2 y = 0$

(C) $\frac{d^2y}{dt^2} + 2k\frac{dy}{dt} + w^2 y = 0$

(D) $\frac{d^2y}{dt^2} + w^2 y = F$

67. Hydrogen cannot be liquified at room temperature by application of pressure because -

(A) it has a low density.
(B) its thermal conductivity is high.
(C) it is explosive.
(D) its critical temperature is lower than the room temperature.

68. National Science Day is celebrated in honour of -

(A) Homi Bhabha. (B) Sir C.V. Raman.
(C) Vikram Sarabhai. (D) Ramanujam.

69. In natural convection a heated portion of liquid moves because -
(A) its molecular motion gets aligned.
(B) the buoyancy by the rest of the liquid pulls this.
(C) viscosity of the liquid drags this.
(D) the density of the heated portion is less than that of surrounding portion of the liquid.

70. Steam at $100^{\circ}C$ causes severe burns than hot water at $100^{\circ}C$ because the steam -

(A) is a vapour. (B) has higher pressure.
(C) has higher kinetic energy. (D) has more quantity of heat.

71. A perfect Carnot's engine working with a gas has a source temperature of 500 k and a sink temperature of 375 k. If the engine takes 600 kilo calories per cycle from source, amount of heat rejected is -

(A) 450 kilo cal. (B) 150 kilo cal.
(C) 750 kilo cal. (D) 300 kilo cal.

72. Natural evaporation gives us a feeling of -

(A) heating. (B) cooling.
(C) perspiration. (D) fogy environment.

73. The hairs of a shaving brush cling when taken out of water. This is due to -

(A) viscosity of water. (B) elastic property.
(C) adhesion. (D) surface tension of water.

74. The displacement of a body is given by $x = \sqrt{a^2 - t^2}$ where t represents the time variable. The velocity of the body is -

(A) $\frac{1}{2}\left(a^2 - t^2\right)^{-\frac{1}{2}}$ (B) $\frac{1}{2}\left(a^2 - t^2\right)^{\frac{3}{2}}$

(C) $-t\left(a^2 - t^2\right)^{-\frac{1}{2}}$ (D) $t\left(a^2 - t^2\right)^{-\frac{1}{2}}$

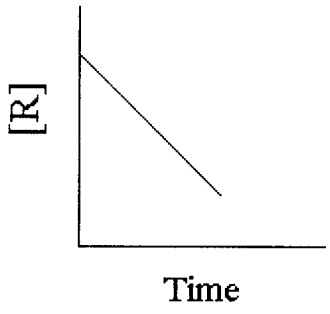
75. The vector atom model was validated by the experiment of -

(A) Zeeman. (B) Rutherford.
(C) Stern-Gerlach. (D) Sommerfeld.

CHEMISTRY

76. Which graph is suggestive of an irreversible second order reaction of the type $2R \rightarrow P$?

(A)



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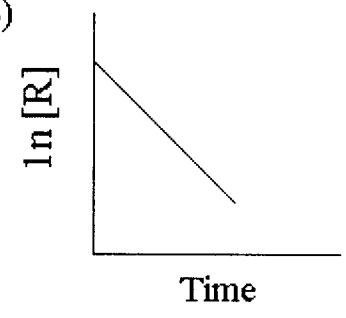

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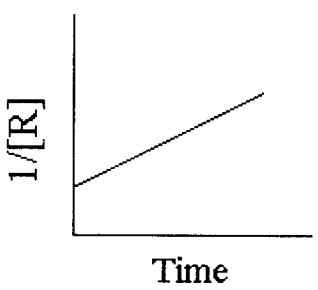
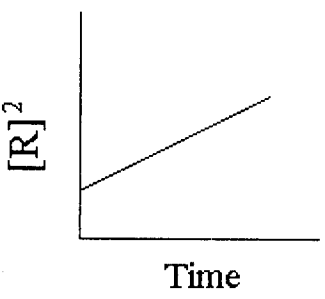


(D)



77. 27.15 *ml* of 0.245 *M HCl* is required to titrate 20.00 *ml* of $Ba(OH)_2$ solution. What is the molarity of $Ba(OH)_2$ solution?

(A) 0.333
(B) 0.666
(C) 0.083
(D) 0.166

78. How many hydrogen atoms are present in one mole of ammonium benzoate, $NH_4C_7H_5O_2$?

(A) 6.022×10^{24}
(B) 2.4×10^{24}
(C) 5.4×10^{24}
(D) One mole.

79. The temperature of a gas sample is increased from $50^{\circ}C$ to $100^{\circ}C$. By what factor must the pressure be changed if the volume is to be kept constant?

(A) 2.0
(B) 1.15
(C) 0.87
(D) 0.5

80. 2.14 grams of a gas X_2 occupy a volume of 1.50 L at STP (273.15 K, 1 atm). What is the gas?

(A) Cl_2 (B) H_2
(C) N_2 (D) O_2

81. What is the change in oxidation number of sulphur in the half-reaction, $S_4O_6^{2-} + 10H_2O \rightarrow 4SO_4^{2-} + 20H^+ + 14e^-$?

(A) + 3 to + 8 (B) + 4 to + 1
(C) +6 to $+2\frac{1}{2}$ (D) $+2\frac{1}{2}$ to +6

82. One atomic mass unit (u) is_____

(A) exactly equal to $\frac{1}{12}$ of the mass of $^{12}_{6}C$ atom.
(B) exactly equal to $\frac{1}{12}$ of the mass of $^{13}_{6}C$ atom.
(C) exactly equal to the mass of one atom of $^{13}_{6}C$.
(D) exactly equal to the mass of one atom of $^{12}_{6}C$.

83. How many spherical atoms are within a face-centered cubic unit cell?
(A) 4 (B) 0
(C) 2 (D) 1

84. Which of the following is planar?
(A) CH_3^- (B) $CH_3^{\bullet}$
(C) CH_3^+ (D) CD_3^-

85. Helium diffuses _____ at the same temperature.

(A) 16 times as fast as methane (B) 4 times as fast as methane
(C) twice as fast as methane (D) at the same rate as methane

86. A solution of pH = 3 is 100 times more acidic than a solution with pH = ?

(A) 7.0 (B) 5.0
(C) 0.05 (D) 1.0

87. Fill the blank in the nuclear reaction, $^{1}_{0}n + {}^{14}_{7}N \rightarrow$? $+ {}^{1}_{1}p$

(A) $^{12}_{6}C$ (B) $^{13}_{6}C$
(C) $^{14}_{7}N$ (D) $^{14}_{6}C$

88. The mass percent of carbon in methanol, CH_3OH , is -

(A) 37.5% (B) 12.5%
(C) 16.7% (D) 12.0%

89. Which among the following is the greenhouse gas?

(A) CO_2. (B) H_2O.
(C) NO. (D) O_3.

90. Which among the following has the highest electrical conductivity at room temperature?

(A) Pure silver.
(B) 0.010 M aqueous sodium chloride solution.
(C) Pure water.
(D) 0.010 M aqueous sucrose solution.

91. Among the 0.01 $mol\ kg^{-1}$ solutions of CH_3OH and $NaCl$ which one would show higher depression in freezing point?

(A) CH_3OH solution.
(B) Both CH_3OH and $NaCl$ solution.
(C) $NaCl$ solution.
(D) Neither CH_3OH nor $NaCl$ solution.

92. Emulsion is -
(A) droplets of liquid dispersed in solid.
(B) droplets of one liquid dispersed in another liquid.
(C) a micelle.
(D) aerosol.

93. The IUPAC name of neopentyl chloride is -
(A) 2-chloro-2-methyl butane.
(B) 1-chloro-2, 2-dimethyl propane.
(C) 3-chloro-2, 2-dimethyl propane.
(D) 2-chloro-2-methyl pentane.

94. Which reagent converts an alkyl halide to an alkene?

(A) aq. KOH. (B) PCl_5.
(C) alcoholic KOH. (D) $SOCl_2$.

95. Which one of the following is not an organometallic compound?

(A) $(C_2H_5)_4 Pb$ (B) C_2H_5Li
(C) C_2H_5MgI (D) C_2H_5ONa

96. Terylene is a -
(A) homopolymer. (B) polyamide.
(C) polyester. (D) polyether.

97. Pyrogallol is -
(A) 1, 2-dihydroxy benzene. (B) 1, 3-dihydroxy benzene.
(C) 1,2, 3-trihydroxy benzene. (D) 1, 2, 4-trihydroxy benzene.

98. The compound obtained by treating di-ethyl ether with strong *HCl* is-
(A) ethyl hydrogen chloride. (B) ethyl chloride.
(C) ethyl alcohol. (D) diethyl oxonium chloride.

99. Which of the following is ortho- and para-directing group?
(A) $-OCH_3$ (B) $-NO_2$
(C) $-CHO$ (D) $-COOH$

100. IUPAC name of acrolein is -
(A) propanol. (B) 2-propenol.
(C) 2-propenal. (D) propanone.

101. The compound which occurs in the oil of winter green and other essential oils is -
(A) methyl salicylate. (B) ethyl benzoate.
(C) benzyl alcohol. (D) mycriyl palmitate.

102. The formation of benzanilide, from aniline and benzoyl chloride in the presence of *NaOH* is called -
(A) Carbylamine reaction. (B) Condensation reaction.
(C) Schotten-Baumann reaction. (D) Diazotisation reaction.

103. Which among the following is the most basic?
(A) Ammonia. (B) Benzylamine.
(C) Ethylamine. (D) Aniline.

104. For the maturation of RBC the essential vitamin required is-
(A) Pyridoxin. (B) Cyanocobalamine.
(C) Ergocalciferol (vitamin D) (D) Vitamin K.

105. The deficiency of Vitamin D causes -
(A) beriberi. (B) rickets.
(C) sterility. (D) scurvy.

106. An example of non-reducing sugar is -

(A) cane sugar. (B) fructose.
(C) lactose. (D) maltose.

107. Nylon is prepared from -
(A) ethylene glycol + adipic acid.
(B) adipic acid + hexamethylene diamine.
(C) ethylene glycol + nitric acid.
(D) hexamethylene diamine + phthalic acid.

108. Paracetamol has both -
(A) analgesic and antiseptic property.
(B) analgesic and antipyretic property.
(C) anesthetic and antipyretic property.
(D) antipyretic and antiseptic property.

109. Which molecule has dipole moment?
(A) NO (B) N_2
(C) CCl_4 (D) C_6H_6

110. What is the bond order of Li_2 molecule?
(A) 1 (B) 0.5
(C) 1.5 (D) 0

111. Ionisation energy is measured by -
(A) Photoelectron spectroscopy. (B) Bomb calorimeter.
(C) X-ray diffraction. (D) Slater rule.

112. Which ion in the gaseous state has the greatest number of unpaired electrons?
(A) Cu^{2+} (B) Ni^{2+}
(C) Zn^{2+} (D) Ge^{2+}

113. The brown ring test is often used to identify nitrates qualitatively in the laboratory. Which species is formed in the brown ring?
(A) $[Fe(NO)]^{3+}$ (B) $[Fe(NO)]^{2+}$
(C) $[Fe(CN)_6]^{4-}$ (D) $Fe(OH)_3$

114. The important ore of manganese is -
(A) chromite. (B) pyrolusite.
(C) gypsum. (D) pitch blende.

115. The amalgam used for dental filling is -

(A) Silver-tin amalgam. (B) Gold amalgam.
(C) Iron amalgam. (D) Sodium amalgam.

116. Which one of the following is a double salt?
(A) Ferrous ammonium sulphate. (B) Potassium ferrocyanide.
(C) Tetramine copper sulphate. (D) Calcium phosphate.

117. Charge on the metal Cr in $[Cr(H_2O)_5Cl]^{2+}$ is -
(A) + 4 (B) +3
(C) + 2 (D) + 6

118. A product of the reaction of silver nitrate, $AgNO_3$, with calcium chromate, $CaCrO_4$, in aqueous solution is -
(A) $CaNO_3$. (B) Ag_2CrO_4.
(C) $AgCrO_4$. (D) Ag_2NO_3.

119. An example for Lewis acid is -
(A) CO. (B) HCl.
(C) BF_3. (D) CO_2

120. The oxidation state of Ni in $Ni(CO)_4$ is -
(A) 3 (B) 4
(C) 2 (D) 0

121. Boron doped silicon is a -
(A) n-type semiconductor. (B) p-type semiconductor.
(C) superconductor. (D) metal.

122. Which metal ion is sandwiched between the two planar cyclopentadiene rings in ferrocene molecule?
(A) Fe^{3+} (B) Fe^{2+}
(C) Cr^{2+} (D) Ni^{2+}

123. At 90 K, $YBa_2Cu_3O_7$ behaves as a -
(A) ionic conductor. (B) electronic conductor.
(C) superconductor. (D) insulator.

124. The number of electrons $^{27}_{13}Al$ contains -
(A) 13. (B) 27.
(C) 14. (D) 40.

125. An alpha particle is -
(A) a charged hydrogen atom.
(B) a negatively charged particle of mass number one.
(C) an electron.
(D) the nucleus of a helium atom.

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