Target's

20 Question Paper Set

MHT-CET

Medical & Engineering

Target Publications Pvt. Ltd.

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MHT–CET
Medical and Engineering

Second Edition: October 2015

Salient Features

- Set of 20 questions papers with solutions each for Physics, Chemistry, Biology and Mathematics.
- Prepared as per the MHT-CET syllabus.
- Exhaustive coverage of MCQ's from all chapters.
- Hints provided wherever necessary.
- Simple and Lucid language.
- Self-evaluative in nature

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Preface

'MHT-CET: 20 Question Paper Set' is a series of 20 question papers. Every test is designed as per the MHT-CET format. Each test is divided into the following three parts:

Part	Subject	No. of Questions	Total Marks
I	Physics + Chemistry	50 + 50 = 100	100
II	Botany + Zoology	50 + 50 = 100	100
III	Mathematics	50	100

While preparing the book, utmost care has been taken to include a broad range of objective questions so that no concept is left unattended and also to make it absolutely error-free.

Each question has been specifically selected to prepare the students on a competitive level. Hints have been provided for selected multiple choice questions to help the students overcome conceptual or mathematical hindrances.

Each question set will help the students to test their range of preparation and knowledge of each topic. The book will act as a guide for students at the time of revision and will provide proper and thorough practice giving the students an edge above the rest.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

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A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

Yours faithfully,

Publisher

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MODEL TEST – 01 (PART- I)

1. A gas is being compressed adiabatically. The specific heat of the gas during compression is
   (A) zero
   (B) infinite
   (C) finite but non-zero
   (D) undefined

2. Which of the following can not be polarised?
   (A) Radio waves.
   (B) Ultraviolet rays.
   (C) Infrared rays.
   (D) Ultra sonic waves.

3. The moment of inertia of a wheel about the axis of rotation is 3.0 MKS units. Its kinetic energy will be 600 joule if the period of rotation is
   (A) 0.05 s (B) 0.31 s
   (C) 3.18 s (D) 20 s

4. de Broglie hypothesis treated electrons as
   (A) Particles (B) Waves
   (C) Both (A) and (B) (D) None of these

5. The amplitude of S.H.M.
   $y = 2(\sin 5\pi t + \sqrt{2} \cos 5\pi t)$ is
   (A) 2 (B) $2\sqrt{2}$
   (C) 4 (D) $2\sqrt{3}$

6. In Young's experiment, the distance between two slits is 8 mm and the distance between screen and slit is 1.2 m. If the fringe width is 0.75 mm, then the wavelength of light is
   (A) 5500 Å (B) 5200 Å
   (C) 5000 Å (D) 4500 Å

7. In cyclotron, the applied magnetic field.
   (A) increases the speed of particle only.
   (B) changes the direction of particle only.
   (C) changes the direction of particle and increases speed.
   (D) neither changes the direction nor increases the speed.

8. In the study of transistor as an amplifier, if $\alpha = I_C/I_E$ and $\beta = I_C/I_B$, where I_C, I_B and I_E are the collector, base and emitter currents, then
   (A) $\beta = \frac{1-\alpha}{\alpha}$ (B) $\beta = \frac{\alpha}{1-\alpha}$
   (C) $\beta = \frac{\alpha}{1+\alpha}$ (D) $\beta = \frac{1+\alpha}{\alpha}$

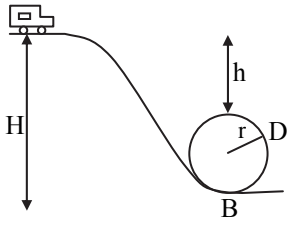
9. If the radius of soap bubble is four times that of another, then the ratio of their pressure will be
   (A) 1 : 4 (B) 4 : 1 (C) 16 : 1 (D) 1 : 16

10. In a hydrogen-like atom, electron makes transition from an energy level with quantum number n to another with quantum number (n – 1). If n >> 1, the frequency of radiation emitted is proportional to
    (A) $\frac{1}{n}$ (B) $\frac{1}{n^2}$ (C) $\frac{1}{n^{3/2}}$ (D) $\frac{1}{n^3}$

11. A car sounding a horn of frequency 1000 Hz passes an observer. The ratio of frequencies of the horn noted by the observer before and after passing of the car is 11 : 9. If the speed of sound is v, the speed of the car is
    (A) $\frac{1}{10}$v (B) $\frac{1}{5}$v (C) $\frac{1}{2}$v (D) v

12. In a current carrying long solenoid, the field produced does not depend upon
    (A) number of turns per unit length.
    (B) the current flowing.
    (C) radius of the solenoid.
    (D) all of the above.

13. A toy car rolls down the inclined place as shown in the fig. It loops the loop at the bottom. What is the relation between H and h?
    (A) $\frac{H}{h} = 2$
    (B) $\frac{H}{h} = 3$
    (C) $\frac{H}{h} = 9$
    (D) $\frac{H}{h} = 5$



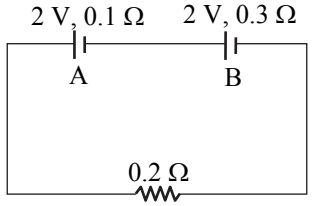
14. The T.V. transmission tower in Delhi has a height of 250 m. What is the distance upto which the broadcast can be received? (Take $R = 6.4 \times 10^6$ m)
(A) 50 km (B) 60 km
(C) 56.6 km (D) 54.6 km

15. The compressibility of water is 4×10^{-5} per atm. The decrease in volume of 100 cm^3 of water under a pressure of 100 atmospheres will be
(A) 0.004 cm^3 (B) 0.04 cm^3
(C) 0.4 cm^3 (D) 4 cm^3

16. If the momentum of a photon is p, then its frequency is
(A) $\frac{ph}{c}$ (B) $\frac{pc}{h}$
(C) $\frac{mh}{c}$ (D) $\frac{mc}{h}$
where, m is the rest mass of the photon

17. A 4 kg stone tied at the end of a 1m long string is whirled in a vertical circle. At the instant, when the string makes an angle θ with the vertical, the speed of stone is 4 m/s and the tension in the thread is 103.2 N. Then θ is
(A) 0° (B) 30° (C) 60° (D) 90°

18. The internal resistances of two cells shown are $0.1\,\Omega$ and $0.3\,\Omega$. If $R = 0.2\,\Omega$, the potential difference across



(A) B will be zero
(B) A will be zero
(C) A and B will be 2 V
(D) A will be > 2 V and B will be < 2 V

19. The ratio of the K.E. and P.E. possessed by a body executing SHM when it is at a distance of $\frac{1}{n}$ of its amplitude from the mean position is
(A) $n^2 : 1$ (B) $\frac{1}{2} n^2 : 1$
(C) $(n^2 + 1) : 1$ (D) $(n^2 - 1) : 1$

20. Angular width of central maximum of a diffraction pattern on a single slit does not depend upon
(A) distance between slit and source.
(B) wavelength of light used.
(C) width of the slit.
(D) wavelength of light used and width of the slit.

21. A gas for which $\gamma = 1.5$ is suddenly compressed to $\left(\frac{1}{4}\right)^{th}$ of the initial volume. Then the ratio of the final to the initial pressure is
(A) 1 : 16 (B) 1 : 8 (C) 1 : 4 (D) 8 : 1

22. If an electron jumps from 1^{st} orbital to 3^{rd} orbital, then it will
(A) absorb energy
(B) release energy
(C) be no gain of energy
(D) be no loss of energy

23. A closed organ pipe and an open organ pipe have their first overtone identical in frequency. Their lengths are in the ratio
(A) 1:2 (B) 3:4
(C) 2:3 (D) 4:5

24. The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an a.c. supply of 120 V and the current flowing in it is 10 A. The voltage and the current in the secondary are
(A) 240 V, 5 A (B) 240 V, 10 A
(C) 60 V, 20 A (D) 120 V, 20 A

25. A thick copper rope of density 1.5×10^3 kg/m^3 and Young's modulus 5×10^6 N/m^2, 8 m in length when hung from the ceiling of the room, the increase in its length due to its own weight is [$g = 10$ ms^{-2}]
(A) 9.6×10^{-3} m (B) 9.6×10^{-2} m
(C) 9.6×10^{-1} m (D) 9.6 m

26. In photoelectric experiment if both the intensity and frequency of the incident light are doubled, then the saturation of photoelectric current
(A) remain same
(B) is halved
(C) is doubled
(D) becomes four times

27. A car of mass 1000 kg moves on a circular path with constant speed of 16 m/s. It turned through 90° after travelling 628 m on the road. The centripetal force acting on the car is
(A) 160 N (B) 320 N
(C) 640 N (D) 1280 N

28. Two coherent sources are obtained by division of wavefront in
(A) Young's experiment.
(B) Soap film.
(C) Thin oil film.
(D) Newton's experiment.

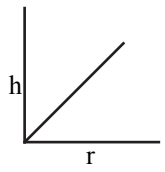
29. Beats are produced by the superimposition of two waves of nearly equal frequencies. Which of the following statements is CORRECT?
(A) All particles of the medium vibrate simple harmonically with frequency equal to the difference between the frequencies of the component waves.
(B) The frequency of beats changes with the location of the observer.
(C) The frequency of beats changes with time.
(D) Amplitude of vibration of particles at any point changes simple harmonically with frequency equal to one half of the difference between the component waves.

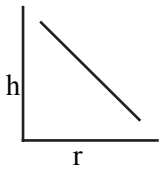
30. The work function of a metal is 1 eV. Light of wavelength 3000 Å is incident on this metal surface. The velocity of emitted photo-electrons will be
(A) 10 m/s (B) 1×10^3 m/s
(C) 1×10^4 m/s (D) 1×10^6 m/s

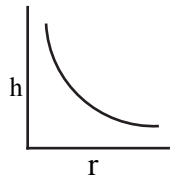
31. An earth satellite of mass m revolves in a circular orbit at a height h from the surface of the earth. R is the radius of the earth and g is acceleration due to gravity at the surface of the earth. The velocity of the satellite in the orbit is given by
(A) $\frac{gR^2}{R+h}$ (B) gR
(C) $\sqrt{\frac{gR}{R+h}}$ (D) $\sqrt{\frac{gR^2}{R+h}}$

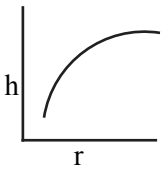
32. A plane wavefront is formed
(A) from a diverging spherical source of light.
(B) from a converging spherical source of light.
(C) from any spherical source of light with small value of radius.
(D) with large enough radius tending to infinity of a spherical wavefront.

33. The most appropriate graph between height (h) of the liquid column in a capillary tube and the radius (r) of the tube for a given liquid will be

(A) 

(B) 

(C) 

(D) 

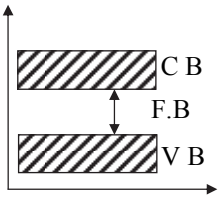
34. The expression for the induced e.m.f contains a negative sign $(e = -\frac{d\phi}{dt})$. What is the significance of the negative sign?
(A) The induced e.m.f is produced only, when the magnetic flux decreases.
(B) The induced e.m.f opposes the changes in the magnetic flux.
(C) The induced emf is opposite to the direction of the flux.
(D) None of the above.

35. If you set up the seventh harmonic on a string fixed at both ends, how many nodes and antinodes are set up in it?
(A) 8, 7 (B) 7, 7
(C) 8, 9 (D) 9, 8

36. A rigid body is rotating with variable angular velocity (a – bt) at any instant of time t. The total angle subtended by it before coming to rest will be (a and b are constants)
(A) $\frac{(a-b)a}{2}$ (B) $\frac{a^2}{2b}$
(C) $\frac{a^2-b^2}{2b}$ (D) $\frac{a^2-b^2}{2a}$

37. The power radiated by a black body is P and it radiates maximum energy around the wavelength λ_0. The temperature of black body is now changed such that it radiates maximum energy near $\frac{3\lambda_0}{4}$. The power radiated by it will increase by a factor of
(A) $\frac{16}{9}$ (B) $\frac{4}{3}$
(C) $\frac{64}{27}$ (D) $\frac{256}{81}$

38. The diagram shown below corresponds to,



(A) the single energy level of an electron.
(B) the discrete energy level of an electron.
(C) the energy transfer diagram.
(D) the energy band diagram.

39. A geostationary satellite can be installed
(A) over any city on the equator.
(B) over the north or south pole.
(C) at height R above earth.
(D) at the surface of earth.

40. The relative permeability of a substance A is slightly greater than unity and that of a substance B is slightly less than unity. Then,
(A) A is ferromagnetic and B is paramagnetic.
(B) A is diamagnetic and B is paramagnetic.
(C) A is paramagnetic and B is diamagnetic.
(D) A and B are both paramagnetic.

41. Which of the following is not true for a potentiometer?
(A) While measuring e.m.f., it draws current from the source of known e.m.f.
(B) While measuring e.m.f., the resistance of potentiometer becomes infinite.
(C) Its sensitivity is high.
(D) It is based on the null deflection method.

42. The time period of simple pendulum on satellite is
(A) 0 s (B) ∞ s (C) 84.6 s (D) 2 s

43. A rectangular coil of area 5.0×10^{-4} m^2 and 60 turns is pivoted about one of its vertical sides. The coil is in a radial horizontal field of 90 gauss. If a current of 0.20 mA produces an angular deflection of 18°, then the torsional constant of the spring connected to the coil is (in Nm/degree)
(A) 3×10^{-9} (B) 3×10^{-7}
(C) 3×10^{-11} (D) 3×10^{-5}

44. Eddy current may be reduced by using
(A) laminated core of wood.
(B) laminated core of soft iron.
(C) thick piece of cobalt.
(D) thick piece of nickel.

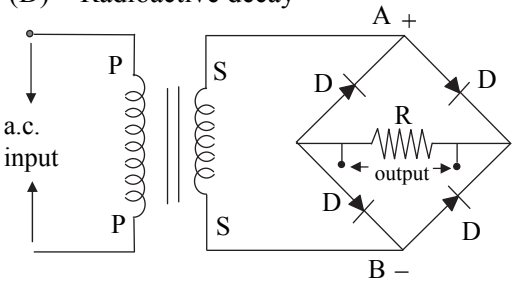
45. Perfectly black body appears black in colour because
(A) body does not reflect radiation.
(B) body does not transmit radiation.
(C) body neither reflects nor transmits the radiation.
(D) body absorbs black colour.

46. A resistance of 5 Ω is connected in the left gap of a metre bridge and 15 Ω in the other gap. The position of the balancing point is
(A) 10 cm (B) 20 cm (C) 25 cm (D) 75 cm

47. The ability of a conductor to store electrical charge is called as _____.
(A) capacitance (B) resistance
(C) inductance (D) reactance

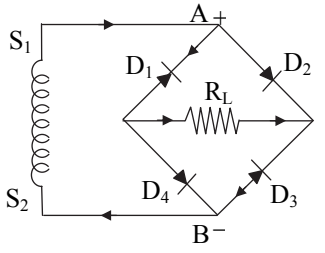
48. Which of the following are suitable for the fusion process?
(A) Heavy nuclei
(B) Light nuclei
(C) Atom bomb
(D) Radioactive decay

49.



In above circuit, the path of current flowing through the circuit is,

(A)



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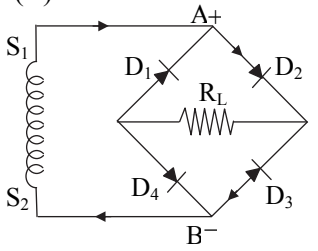

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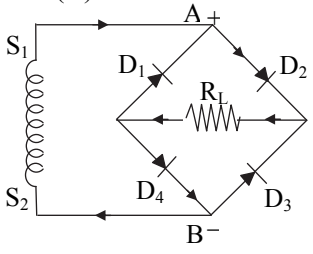
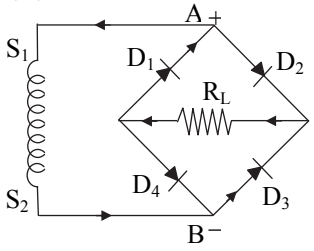


(D)



50. In dielectrics, polarization (P) has dimensions
(A) $[M^0L^0T^0A^1]$ (B) $[M^0L^2T^0A^1]$
(C) $[M^0L^{-2}T^0A^1]$ (D) $[M^0L^{-2}T^1A^1]$

51. Which of the following is a paramagnetic material?
(A) TiO_2 (B) VO_2
(C) O_2 (D) All of these

52. In a chemical reaction, $2A + B \longrightarrow C + D$
Find the INCORRECT statement.
(A) Rate of disappearance of (B) = Rate of appearance of (C) = rate of appearance of (D)
(B) $\frac{1}{2}$ rate of disappearance of (A) = rate of appearance of (C) or (D)
(C) Twice the rate of disappearance of A = rate of disappearance of (B)
(D) $\frac{1}{2}$ the rate of disappearance of (A) = rate of disappearance of (B)

53. Orlon has monomeric units of _____.
(A) vinyl cyanide (B) buta-1,3-diene
(C) ethylene glycol (D) isoprene

54. The formation of aldehyde from an alkyl cyanide using $SnCl_2$/conc.HCl is known as _____.
(A) Stephen reaction
(B) Rosenmund reduction
(C) Wurtz reaction
(D) Etard reaction

55. Which metal is used in Wurtz synthesis?
(A) Ba (B) Al
(C) Na (D) Fe

56. The primary valences are _____.
(A) non-rigid and non-directional
(B) rigid and directional
(C) non-rigid and directional
(D) rigid and non-directional

57. Acidified potassium dichromate is treated with hydrogen sulphide. In the reaction, the oxidation number of chromium _____.
(A) increases from +3 to +6
(B) decreases from +6 to +3
(C) remains unchanged
(D) decreases from +6 to +2

58. Which of the following does NOT contain P—O—P bond ?
(A) Pyrophosphorus acid
(B) Polymetaphosphoric acid
(C) Pyrophosphoric acid
(D) Hypophosphoric acid

59. The integrated rate law is a direct relationship between _____ and _____.
(A) time, concentration of the reactants
(B) time, concentration of the products
(C) time, activation energy of the reaction
(D) time, activity of catalyst

60. The space between the outermost filled energy band and the next empty band is called _____.
(A) valence band (B) conduction band
(C) forbidden zone (D) none of these

61. 8 gm of CH_4 is completely burnt in air. The number of moles of water produced are _____.
(A) 0.5 (B) 1
(C) 2 (D) 18

62. Which of the following statement is CORRECT?
(A) Gangues are carefully chosen to combine with the slag present in the ore to produce easily fusible flux to carry away the impurities.
(B) Slags are carefully chosen to combine with the flux present in the ore to produce easily fusible gangue to carry away the impurities.
(C) Gangues are carefully chosen to combine with the flux present in the ore to produce easily fusible slag to carry away the impurities.
(D) Fluxes are carefully chosen to combine with the gangue present in the ore to produce easily fusible slag to carry away the impurities.

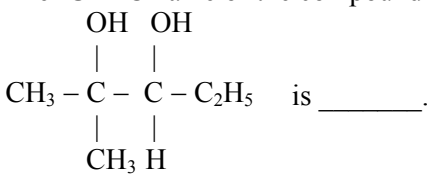
63. _____ is least soluble in water.
(A) Helium (B) Neon
(C) Xenon (D) Krypton

64. What is the potential of a half-cell consisting of zinc electrode in 0.01M $ZnSO_4$ solution at 25 °C ($E° = –0.763$ V)?
(A) –0.8221 V (B) 8.221 V
(C) –0.5282 V (D) 9.232 V

65. Lucas reagent is a mixture of _____.
(A) conc.HCl and anhydrous $ZnCl_2$
(B) conc.HCl and hydrated $ZnCl_2$
(C) conc.HNO_3 and hydrated $ZnCl_2$
(D) conc.HNO_3 and anhydrous $ZnCl_2$

66. Which of the following is NOT an antimicrobial?
(A) Antibiotic (B) Antiseptic
(C) Disinfectant (D) Antacids

67. The IUPAC name of the compound



is _____.

(A) 4-methylpentane-1,2-diol
(B) 2-methylpentane-2,3-diol
(C) 2-methylhexane-1,2-diol
(D) 2-methylhexane-2,3-diol

68. Carbohydrates are used by body mainly _____.
(A) for obtaining vitamins
(B) as a source of energy
(C) for all its developmental needs
(D) for building muscles

69. Grignard reagents are obtained by using dry reactants because they react with water to form _____.
(A) ketone (B) an alkane
(C) an aldehyde (D) alcohol

70. Which statement is CORRECT for the boiling point of solvent containing a dissolved non-volatile solute?
(A) Boiling point of the liquid gets lowered.
(B) Boiling point of the liquid gets elevated.
(C) There is no effect of the added solute on the boiling point.
(D) The change depends upon the nature of the solute.

71. The molecular formula of tear gas is _____.
(A) SO_2Cl_2
(B) $CCl_3.NO_2$
(C) $COCl_2$
(D) $Cl.C_2H_4 – S – C_2H_4.Cl$

72. Comparing a voltaic cell and an electrolytic cell which of the following is a TRUE statement?
(A) In both the cells, anode is where oxidation occurs and cathode is where reduction occurs.
(B) In both the cells, cathode is where oxidation occurs and anode is where reduction occurs.
(C) In the former oxidation takes place at anode and reduction at cathode and it is vice–versa in the latter.
(D) In the former reduction takes place at anode and oxidation at cathode and it is vice–versa in the latter.

73. Arene diazonium salts are used as useful intermediates to introduce _____ group into aromatic ring.
(A) –F (B) –CN
(C) –OH (D) All of these

74. In the formation of an aldol, α-carbon atom of one aldehyde molecule attaches to _____ of another aldehyde molecule.
(A) α-hydrogen atom
(B) α-carbon atom
(C) carbonyl carbon atom
(D) β-carbon atom

75. In the following reaction:
Ether $\xrightarrow{\text{hot HI}}$ A + B + H_2O,
If A and B are identical, the ether is _____.
(A) simple
(B) mixed
(C) simple or mixed
(D) cannot be predicted unless the nature of alkyl radicals is known

76. The CORRECT IUPAC name for $K_2[PtCl_6]$ is _____.
(A) potassium platinumhexachloride
(B) potassium hexachloroplatinum (IV)
(C) potassium hexachloroplatinate (IV)
(D) potassium hexachloroplatinum

77. Which of following elements are included in actinide series?
(A) Th to Lr (B) Ac to Lr
(C) Ac to No (D) Th to No

78. Hydrogen-oxygen fuel cells are used in space-craft to supply _____.
(A) oxygen and hydrogen
(B) power and water
(C) CO_2 and power
(D) water and oxygen

79. Isothermally and reversibly one mole of neon expands from 2 m^3 to 20 m^3 and produces 831.4J of work. The temperature at which expansion takes place is _____. ($R = 8.314\ JK^{-1}mol^{-1}$)
(A) 434.2 K (B) 4342 K
(C) 43.42 K (D) 316.42 K

80. Which of the following oxoacids of sulphur contains a peroxy group?
(A) $H_2S_2O_2$ (B) $H_2S_2O_8$
(C) $H_2S_2O_6$ (D) $H_2S_2O_4$

81. The ΔH and ΔS for a reaction at one atmospheric pressure are +30.558 kJ and 0.066 kJ K^{-1} respectively. The temperature at which the free energy change will be zero and below this temperature the nature of reaction would be _____.
(A) 483 K, spontaneous
(B) 443 K, non-spontaneous
(C) 443 K, spontaneous
(D) 463 K, non-spontaneous

82. Solubility of aliphatic amines _____ with increase in molar mass.
(A) increases (B) decreases
(C) remains constant (D) none of these

83. Enantiomers _____.
(A) are two optical isomers of the same compound
(B) have identical chemical properties
(C) rotate the plane of the plane polarised light by equal amount, but in opposite direction
(D) all of these

84. When white phosphorus (P_4) is treated with thionyl chloride, the products obtained are _____.
(A) PCl_3 and PCl_5
(B) PCl_3 and $POCl_3$
(C) PCl_3, S_2Cl_2 and SO_2
(D) PCl_3, PCl_5 and S_2Cl_2

85. The number of unpaired electrons in low spin octahedral complexes of Cr^{2+} (d^4) and Fe^{3+} (d^5) are _____ respectively.
(A) 0 and 1 (B) 2 and 1
(C) 0 and 2 (D) 1 and 0

86. From chromium to nickel, the strength of metallic bonds _____.
(A) decreases continuously
(B) increases continuously
(C) remains the same
(D) increases till the first three elements and then decreases

87. The unit of equivalent conductivity is _____.
(A) ohm cm
(B) $ohm^{-1}cm^2$ (gm equivalent)$^{-1}$
(C) ohm cm^2 (gm equivalent)
(D) Scm^{-2}

88. The number of moles of KCl in 1000 mL of 3 M solution is _____.
(A) 1 (B) 2
(C) 3 (D) 1.5

89. The rate constant is given by the equation $k = PZe^{-E_a/RT}$. Which of the following factors should decrease for the reaction to proceed more rapidly?
(A) T (B) Z
(C) E_a (D) P

90. With the increase in the molecular mass, the solubility of the carboxylic acids in water _____.
(A) increases (B) decreases
(C) remains the same (D) none of these

91. Deficiency of which vitamin causes degeneration of spinal cord?
(A) E (B) K
(C) B_{12} (D) A

92. Due to Frenkel defect, the density of ionic solids _____.
(A) increases (B) decreases
(C) does not change (D) changes

93. Imino group is present in _____.
(A) CH_3NH_2 (B) CH_3NHCH_3
(C) $(CH_3)_2CHNH_2$ (D) $(CH_3)_3N$

94. Which of the following is known as freon which is used as a refrigerant?
(A) CCl_2F_2 (B) $CHCl_3$
(C) CH_2F_2 (D) CF_4

95. The reaction of conc. HNO_3 and phenol forms _____.
(A) benzoic acid
(B) salicylic acid
(C) o-and p-nitrophenol
(D) picric acid

96. At high temperature, zinc sulphide reacts with dioxygen to given _____.
(A) $Zn + SO_2$ (B) $Zn + SO_3$
(C) $ZnO + SO_2$ (D) $ZnO + S$

97. At 298 K, 1 L of solution containing 5.00 g of solute shows osmotic pressure of 2.5 atm. The molar mass of the solute is _____.
(A) 12.23 g/mol (B) 48.93 g/mol
(C) 49.55 g/mol (D) 122.3 g/mol

98. In the reaction given below, X and Y are _____ respectively.

$CH_3CN \xrightarrow[NaOH]{H_2O} X \xrightarrow{HCl} Y$

(A) sodium propionate and propionic acid
(B) sodium formate and acetic acid
(C) sodium acetate and acetic acid
(D) sodium propionate and acetic acid

99. When heat is released during the reaction, it is denoted as _____ and when work is done on the system by the surroundings, it is denoted as _____.

(A) positive; positive
(B) negative; negative
(C) positive; negative
(D) negative; positive

100. When silver nitrite react with _____, the reaction occurs at a slower rate.

(A) alkyl iodide
(B) alkyl bromide
(C) alkyl chloride
(D) all of these

Model Test - 01

PART - I

1.	(A)	2.	(D)	3.	(B)	4.	(B)	5.	(D)	6.	(C)	7.	(B)	8.	(B)	9.	(B)	10.	(D)
11.	(A)	12.	(C)	13.	(D)	14.	(C)	15.	(C)	16.	(B)	17.	(A)	18.	(A)	19.	(D)	20.	(A)
21.	(D)	22.	(A)	23.	(B)	24.	(A)	25.	(B)	26.	(C)	27.	(C)	28.	(A)	29.	(D)	30.	(D)
31.	(D)	32.	(D)	33.	(C)	34.	(B)	35.	(A)	36.	(B)	37.	(D)	38.	(D)	39.	(A)	40.	(C)
41.	(A)	42.	(B)	43.	(A)	44.	(B)	45.	(C)	46.	(C)	47.	(A)	48.	(B)	49.	(C)	50.	(D)
51.	(D)	52.	(C)	53.	(A)	54.	(A)	55.	(C)	56.	(A)	57.	(B)	58.	(D)	59.	(A)	60.	(C)
61.	(B)	62.	(D)	63.	(A)	64.	(A)	65.	(A)	66.	(D)	67.	(B)	68.	(B)	69.	(B)	70.	(B)
71.	(B)	72.	(A)	73.	(D)	74.	(C)	75.	(A)	76.	(C)	77.	(A)	78.	(B)	79.	(C)	80.	(B)
81.	(D)	82.	(B)	83.	(D)	84.	(C)	85.	(B)	86.	(A)	87.	(B)	88.	(C)	89.	(C)	90.	(B)
91.	(C)	92.	(C)	93.	(B)	94.	(A)	95.	(D)	96.	(C)	97.	(B)	98.	(C)	99.	(D)	100.	(C)

PART - II

1.	(A)	2.	(B)	3.	(A)	4.	(A)	5.	(B)	6.	(D)	7.	(C)	8.	(A)	9.	(D)	10.	(D)
11.	(C)	12.	(B)	13.	(A)	14.	(B)	15.	(C)	16.	(D)	17.	(D)	18.	(D)	19.	(C)	20.	(B)
21.	(D)	22.	(B)	23.	(D)	24.	(A)	25.	(D)	26.	(D)	27.	(B)	28.	(C)	29.	(B)	30.	(D)
31.	(B)	32.	(D)	33.	(C)	34.	(B)	35.	(A)	36.	(D)	37.	(A)	38.	(B)	39.	(A)	40.	(C)
41.	(D)	42.	(A)	43.	(B)	44.	(A)	45.	(B)	46.	(A)	47.	(C)	48.	(C)	49.	(B)	50.	(D)
51.	(A)	52.	(A)	53.	(D)	54.	(C)	55.	(B)	56.	(C)	57.	(B)	58.	(A)	59.	(B)	60.	(B)
61.	(C)	62.	(B)	63.	(D)	64.	(C)	65.	(C)	66.	(C)	67.	(C)	68.	(D)	69.	(C)	70.	(A)
71.	(A)	72.	(B)	73.	(A)	74.	(B)	75.	(A)	76.	(A)	77.	(D)	78.	(B)	79.	(C)	80.	(A)
81.	(C)	82.	(C)	83.	(B)	84.	(D)	85.	(C)	86.	(C)	87.	(A)	88.	(B)	89.	(C)	90.	(C)
91.	(A)	92.	(D)	93.	(D)	94.	(D)	95.	(D)	96.	(C)	97.	(B)	98.	(A)	99.	(B)	100.	(C)

PART – III

1.	(A)	2.	(C)	3.	(A)	4.	(A)	5.	(D)	6.	(D)	7.	(B)	8.	(D)	9.	(C)	10.	(A)
11.	(A)	12.	(B)	13.	(A)	14.	(B)	15.	(A)	16.	(D)	17.	(B)	18.	(A)	19.	(D)	20.	(A)
21.	(C)	22.	(D)	23.	(D)	24.	(C)	25.	(B)	26.	(A)	27.	(B)	28.	(D)	29.	(B)	30.	(A)
31.	(D)	32.	(B)	33.	(A)	34.	(B)	35.	(B)	36.	(C)	37.	(C)	38.	(C)	39.	(C)	40.	(A)
41.	(A)	42.	(A)	43.	(B)	44.	(D)	45.	(B)	46.	(D)	47.	(B)	48.	(C)	49.	(C)	50.	(A)

Model Test - 01

PART - I

1. $\Delta Q = mc\Delta\theta$. Here $\Delta Q = 0$, hence $c = 0$

2. Ultra sonic waves are longitudinal waves and hence cannot be polarised.

3. $K = \frac{1}{2}I\omega^2$

$\therefore \quad \omega^2 = \frac{2K}{I} = \frac{2\times 600}{3} = 400$

or $\quad \omega = 20$

$\therefore \quad \frac{2\pi}{T} = 20$

$\therefore \quad T = \frac{\pi}{10} = \frac{3.14}{10} = 0.31$ s

5. $y = 2\left(\sin 5\pi t + \sqrt{2}\cos \pi t\right)$

$y = 2 \sin 5\pi t + 2\sqrt{2} \cos \pi t$

$\therefore \quad A = \sqrt{(2)^2 + \left(2\sqrt{2}\right)^2} = \sqrt{4+8} = \sqrt{12} = 2\sqrt{3}$

6. $\lambda = \frac{\beta d}{D} = \frac{0.75\times 10^{-3}\times 8\times 10^{-3}}{1.2}$

$= 5000 \times 10^{-10}$ m $= 5000$ Å

8. As we know $I_E = I_C + I_B$

$\Rightarrow \frac{I_E}{I_C} = 1 + \frac{I_B}{I_C} \Rightarrow \frac{1}{\alpha} = 1 + \frac{1}{\beta}$

$\Rightarrow \beta = \frac{\alpha}{1-\alpha}$

9. Excess pressure in a soap bubble is given by,

$P = \frac{4T}{R}$

If tension remains same, then we have

$P \propto \frac{1}{R} \Rightarrow \frac{P_1}{P_2} = \frac{R_2}{R_1}$

Substituting $R_2 = 4R$; $R_1 = R_1$ we get

$\frac{P_1}{P_2} = \frac{4}{1}$

$\Rightarrow P_1 : P_2 = 4 : 1$

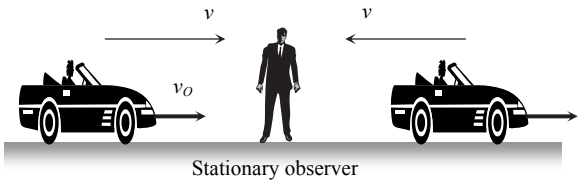
10. $\nu \propto \left(\frac{1}{(n-1)^2} - \frac{1}{n^2}\right)$

$\propto \frac{n^2 - (n-1)^2}{n^2(n-1)^2}$

$\propto \frac{2n-1}{n^2(n-1)^2}$

For $n >> 1$, $\nu \propto \frac{1}{n^3}$

11. $n_{Before} = \frac{v}{v - v_c}n$ and $n_{After} = \frac{v}{v + v_c}.n$



$\therefore \quad \frac{n_{Before}}{n_{After}} = \frac{11}{9} \Rightarrow \left(\frac{v + v_c}{v - v_c}\right) = \frac{11}{9} \Rightarrow v_c = \frac{v}{10}$

13. Velocity at the bottom and top of the circle is $\sqrt{5gr}$ and $\sqrt{gr}$.

$\therefore \quad \frac{1}{2}$ (M) (5gr) = MgH and $\frac{1}{2}$ M(gr) = Mgh

14. $d = \sqrt{2hR}$

Here, h = 250 m, R = 6.4×10^6 m

Hence, $d = \sqrt{2\times 250\times 6.4\times 10^6}$

$= 56.6 \times 10^3$ m $= 56.6$ km

15. Compressibility, $C = \frac{1}{K} = \frac{dV}{Vdp}$

$\therefore \quad dV = Vdp\, C$

$= 100 \times 10^{-6} \times 100 \times 10^5 \times \frac{4\times 10^{-5}}{10^5}$

$= 0.4 \times 10^{-6}$ m^3 $= 0.4$ cm^3

16. $p = \frac{E}{c} = \frac{h\nu}{c} \Rightarrow \nu = \frac{pc}{h}$

17. $T - mg\cos\theta = \frac{mv^2}{r}$

$\therefore \quad 103.2 - 4 \times 9.8 \times \cos\theta = \frac{4\times 4\times 4}{1}$

$\therefore \quad 103.2 - 39.2\cos\theta = 64$

$\therefore \quad 39.2\cos\theta = 103.2 - 64$

$\therefore \quad \cos\theta = \frac{39.2}{39.2} = 1$

$\therefore \quad \theta = 0°$

18. Applying Kirchhoff's law,

$(2+2) = (0.1+0.3+0.2)\,I \Rightarrow I = \frac{20}{3}$ A

Hence potential difference across A

$= 2 - 0.1 \times \frac{20}{3} = \frac{4}{3}$ V (less than 2 V)

Potential difference across $B = 2 - 0.3 \times \frac{20}{3} = 0$

19. $\frac{K.E.}{P.E.} = \frac{\frac{1}{2}m\omega^2\left(A^2 - x^2\right)}{\frac{1}{2}m\omega^2 x^2} = \frac{A^2 - \frac{A^2}{n^2}}{\left(\frac{A^2}{n^2}\right)} = n^2 - 1$

20. For a single slit diffraction pattern
$a \sin\theta = \lambda$ 'a' is slit width.

Angular width $= 2\theta = 2\sin^{-1}\left(\frac{\lambda}{a}\right)$

It is independent of D i.e., distance between screen and slit.

21. $\gamma = 1.5$, $V_2 = \frac{1}{4}V_1$

For an adiabatic process,

$P_1V_1^{\gamma} = P_2V_2^{\gamma}$

$\therefore \quad \frac{P_2}{P_1} = \left(\frac{V_1}{V_2}\right)^{\gamma} = (4)^{1.5} = (2^2)^{\frac{3}{2}} = 2^3 = 8$

$\therefore \quad \frac{P_2}{P_1} = 8 : 1$

22. When an electron jumps from the orbit of lower energy (n = 1) to the orbit of higher energy (n = 3), energy is absorbed.

23. Fundamental frequency of open organ pipe = $\frac{c}{2L_1}$ and that for first overtone $\frac{c}{L_1}$.
Fundamental frequency of closed organ pipe = $\frac{c}{4L_2}$ and that for first overtone = $\frac{3c}{4L_2}$.
Hence $\frac{L_2}{L_1} = \frac{3}{4}$.

24. $\frac{N_s}{N_p} = \frac{E_s}{E_p} \Rightarrow \frac{200}{100} = \frac{E_s}{120} \Rightarrow E_s = 240$ V

also $\frac{E_s}{E_p} = \frac{E_p}{I_s} \Rightarrow \frac{240}{120} = \frac{10}{I_s} \Rightarrow I_s = 5$ A

25. $Y = \frac{Mg(L/2)}{Al} = \frac{AL\rho gL}{2Al} = \frac{L^2\rho g}{2l}$

$l = \frac{L^2\rho g}{2Y} = \frac{(8)^2 \times (1.5\times10^3) \times (10)}{5\times10^6 \times 2}$

$= \frac{64\times1.5\times10^4}{10^7} = 96 \times 10^{-3} = 9.6 \times 10^{-2}$ m

26. The number of photoelectrons emitted is independent of the frequency of incident light but depends upon intensity. So, current becomes double.

27. Since car turns through 90° after travelling 628 m on the circular road, the distance 628 m is quarter of the circumference of the circular path. If R is the radius of the circular path, then

$\frac{1}{4}(2\pi R) = 628$

$\therefore \quad R = \frac{628\times2}{\pi} = \frac{628\times2}{3.14} = 400$ m

v = 16 m/s, m = 1000 kg

$\therefore$ Centripetal force,

$F_{cp} = \frac{mv^2}{R} = \frac{1000\times(16)^2}{400} = 640$ N

28. Same wavefront is incident on two pin holes or two slits which act as coherent sources.

30. $E = \phi + K.E$; $E = \frac{12375}{3000} = 4.125$ eV

$\therefore \quad K.E = E - \phi = 4.125$ eV $- 1$ eV $= 3.125$ eV

$\therefore \quad \frac{1}{2}mv_{max}^2 = 3.125 \times 1.6 \times 10^{-19}$ J

$\therefore \quad v_{max} = \sqrt{\frac{2\times3.125\times1.6\times10^{-19}}{9.1\times10^{-31}}} \approx 1 \times 10^6$ m/s

31. $v_0 = \sqrt{\frac{GM}{r}} = \sqrt{\frac{gR^2}{R+h}}$

32. Radius becomes larger, the wavefront becomes plane.

33. $h = \frac{2T\cos\theta}{r\rho g} \qquad \therefore \quad h \propto \frac{1}{r}$

35. String will vibrate in 7 loops so it will have 8 nodes and 7 antinodes.
Number of harmonics = Number of loops
= Number of antinodes
$\Rightarrow$ Number of antinodes = 7
Hence number of nodes
= number of antinodes + 1 = 7 + 1 = 8

36. Given that $\omega = a - bt$, at time $t = 0$, $\omega = 0$, $\omega_0 = a$

Angular acceleration, $\alpha = \frac{d\omega}{dt} = -b$

$\omega^2 = \omega_0^2 + 2\alpha\theta$

or $0 = a^2 + 2 \times (-b)\theta \quad \therefore \quad \theta = \frac{a^2}{2b}$

37. $P \propto \theta^4 \propto \frac{1}{\lambda^4}$

$\therefore \quad \frac{P_1}{P_2} = \left(\frac{\lambda_2}{\lambda_1}\right)^4$ or $\frac{P_1}{P_2} = \left(\frac{\frac{3\lambda_0}{4}}{\lambda_0}\right)^4 = \frac{81}{256}$

or $P_2 = \frac{256}{81} P_1$

40. $(\mu_r)_p > 1$, $(\mu_r)_d < 1$, $(\mu_r)_F >> 1$

42. Time period of a simple pendulum is given by

$T = 2\pi\sqrt{\frac{l}{g}}$

On a satellite, $g = 0$

$\Rightarrow T = \infty$

43. For equilibrium of coil,

$nBIA = c\theta$

$c = \frac{nBIA}{\theta}$

$= \frac{60 \times 90 \times 10^{-4} \times 0.2 \times 10^{-3} \times 5 \times 10^{-4}}{18}$

$\therefore \quad c = 3 \times 10^{-9}$ Nm/degree

45. Perfectly black body is black in colour because it does not reflect or transmit the radiation.

46. $\frac{x}{100 - x} = \frac{5}{15} = \frac{1}{3}$

$3x = 100 - x$

$\therefore \quad 4x = 100 \quad \therefore \quad x = 25$ cm

49. Point A is at positive potential with respect to B. Thus diodes D_2 and D_4 are in forward bias and can conduct current.

52. Rate $= -\frac{1}{2}\frac{d[A]}{dt} = -\frac{d[B]}{dt}$

$\therefore \quad \frac{1}{2}$ rate of disappearance of (A)

= rate of disappearance of (B)

= rate of appearance of (C)

= rate of appearance of (D)

57. When acidified potassium dichromate is treated with hydrogen sulphide, a pale yellow precipitate of sulphur is obtained and potassium dichromate is reduced to chromic sulphate. Here, the oxidation number of Cr decreases from +6 to +3.

$K_2\overset{(+6)}{Cr_2O_7} + 4H_2SO_4 + 3H_2S \longrightarrow K_2SO_4 + \overset{(+3)}{Cr_2(SO_4)_3} + 7H_2O + 3S$

58. Hypophosphoric acid ($H_4P_2O_6$) contains four P – OH, two P = O and one P – P bond.

59. By using the integrated rate law, one can calculate the concentration of the reactants at any given time.

61. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

When 1 mole of methane (16 gm) is completely burnt in air, 2 moles of water along with 1 mole of carbon dioxide are produced. Thus, when half a mole of methane (8 gm) is completely burnt in air, 1 mole of water along with ½ mole of carbon dioxide is produced.

63. The solubility of group 18 elements in water increases on moving down the group from He to Xe. Hence, helium is least soluble in water among the given group 18 elements.

64. $E_{electrode} = E° - \frac{0.0591}{2} \log \frac{1}{[Cu^{2+}]}$

$= -0.763 - \frac{0.0591}{2} \log \frac{1}{0.01}$

$= -0.763 - 0.0591 = -0.8221$ V

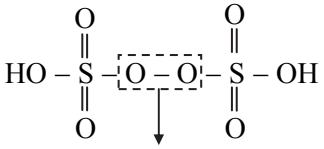
70. When a non-volatile solute is dissolved in a liquid solvent, the boiling point of the resulting solution is elevated due to lowering of vapour pressure of the solution. Elevation in the boiling point is a colligative property which depends only on the number of solute particles and is independent of the nature of the solute.

75. Since A and B are identical (homologous), the two alkyl radicals in the reactant ether has to be same, making it simple ether.

79. $w_{max} = -2.303\ nRT \log_{10} \frac{V_2}{V_1}$

$-831.4 = -2.303 \times 1 \times 8.314 \times T \times \log\left(\frac{20}{2}\right)$

$T = \frac{-831.4}{-2.303 \times 8.314} = 43.42$ K

80. 
(Peroxy group)

Peroxy disulphuric acid ($H_2S_2O_8$)

81. $\Delta G = \Delta H - T\Delta S$

$0 = +30.558 - T \times 0.066$

or $T = \frac{30.558}{0.066} = 463$ K

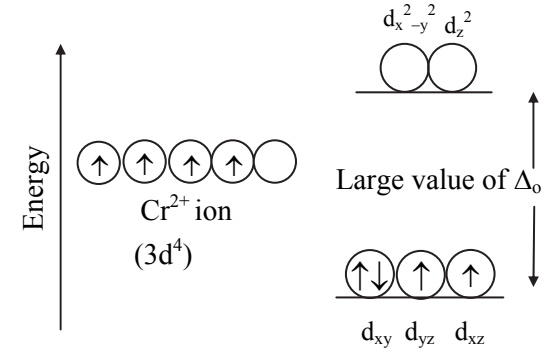
If $(dG)_{T,P} = 0$; reaction is reversible and non-spontaneous.

82. Due to the ability to form hydrogen bonds with water, aliphatic amines (1°, 2° and 3°) are soluble in water (upto six carbon atoms). As molar mass increases, their solubility decreases.

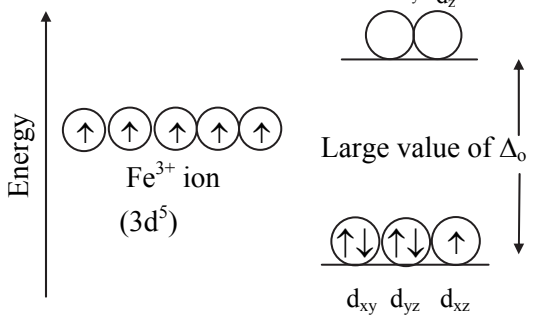
84. When white phosphorus (P_4) is treated with thionyl chloride, the products obtained are PCl_3, S_2Cl_2 and SO_2.

$$P_4 + 8SOCl_2 \longrightarrow 4PCl_3 + 2S_2Cl_2 + 4SO_2$$

White phosphorus; Thionyl chloride; Phosphorous trichloride

85. 

Low spin complex (Strong field ligand)



Low spin complex (Strong field ligand)

86. The strength of metallic bonds depends upon the number of unpaired electrons. Greater the number of unpaired electrons, stronger is the metallic bonding. Chromium has maximum number of unpaired electrons. The number of unpaired electrons decreases from chromium to nickel and hence, the strength of metallic bonds decreases continuously.

88. $\text{Molarity} = \frac{\text{Number of moles of solute}}{\text{Volume of solution in L}}$

$= \frac{n}{V_{\text{Litres}}}$

$\therefore$ $n = \text{molarity} \times V_{\text{Litres}} = 3 \times 1 = 3$ moles

89. For the reaction to proceed more rapidly, P, Z and T should increase and E_a should decrease

$k \propto P$ and $k \propto Z$

Also E_a decreases and T increases

$$\frac{E_a}{RT} \Rightarrow \frac{-E_a}{RT} \Rightarrow e^{\frac{-E_a}{RT}} \Rightarrow k \Rightarrow \text{rate}$$

decreases; increases; increases; increases; increases

90. The solubility of carboxylic acids in water decreases with the increase in molecular mass. Higher carboxylic acids are virtually insoluble in water due to the increased hydrophobic interaction of hydrocarbon part.

93. –NH (imino group) is the functional group of secondary amines like dimethylamine (CH_3NHCH_3), N-methylaniline ($C_6H_5NHCH_3$), etc.

97. According to van't Hoff equation,

$$\pi = \frac{n_2}{V}RT = \frac{W_2}{M_2}\frac{RT}{V}$$

where π = osmotic pressure

T = Temperature

R = Ideal gas constant

V = Volume of solution

W_2 = Weight of solute

M_2 = Molar mass of solute

$\therefore$ $M_2 = \frac{W_2}{\pi}\frac{RT}{V}$

$= \frac{5.00}{2.5} \times \frac{0.0821 \times 298}{1}$

$= 48.93$ g mol^{-1}