

Test Booklet Number

Test - 0902

Roll Number

6038

**PHYSICS & CHEMISTRY**

[Time : 2 Hours]

[Maximum Marks : 200]

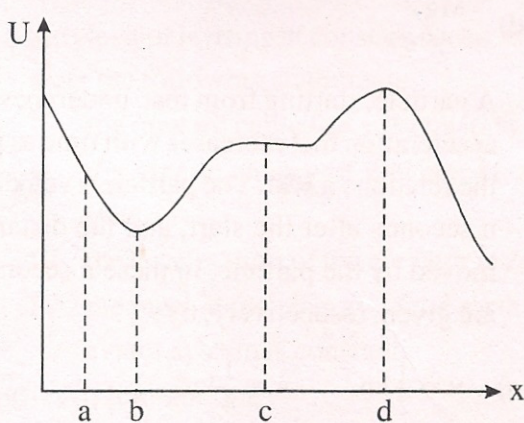
### INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you answer the questions given in this Test Booklet :

1. Answers to questions in this Test Booklet are to be given on a computerised **Answer Sheet** provided to the candidate **separately**.
2. Candidate must fill up Name, Category, Test Booklet Number, Subject Code and Roll Number in the answer sheet carefully as per instructions given.
3. This Test Booklet consists of 100 questions. All questions are compulsory and carry equal marks.
4. Each question in this Test Booklet has four possible alternative answers namely, (a), (b), (c) and (d), one of which is correct. Candidate should choose the correct answer against each question out of four alternative answers.
5. Candidate is instructed to answer the questions by **darkening (●)** with **Ball Point Pen** only in the circle bearing the correct answer.
6. Candidate should not attempt more than one answer in each question. More than one attempt in any form against a question shall be treated as incorrect.
7. Marking of answer other than darkening shall be cancelled and darkening should remain within the circle or otherwise computer shall not accept during evaluation of answer-script.
8. Rough work must not be done on the Answer Sheet. Use the blank space given in the Test Booklet for rough work.
9. Candidate is to handover both the Test Booklet and Answer sheet to the Invigilator before leaving the Examination Hall.
10. **NEGATIVE MARKING** : Each question carries 2 (two) marks for correct response. For each incorrect response,  $\frac{1}{2}$  (half) mark will be deducted from the total score. More than one answer indicated against a question will be deemed as incorrect response and will be negatively marked.



### SET - I (PHYSICS)

1. Dimensions of pressure are same as that of
  - a) gravitational potential
  - b) power
  - c) coefficient of Elasticity
  - d) coefficient of Viscosity
2. A cyclist turns around a curve at 15 km/hr. If he turns at double the speed, the tendency to overturn will be
  - a) doubled
  - b) quadrupled
  - c) halved
  - d) unchanged
3. The diagram shows a plot of the potential energy  $U$  as a function of  $x$  for a particle moving along the  $x$  - axis. The point of stable equilibrium is
 
  - a) a
  - b) b
  - c) c
  - d) d
4. A square lamina of side 'a' and mass  $M$  is rotated about an axis passing through its corner and parallel to one of its diagonal. The moment of inertia is
  - a)  $\frac{Ma^2}{3}$
  - b)  $\frac{5Ma^2}{12}$
  - c)  $\frac{2Ma^2}{3}$
  - d)  $\frac{5Ma^2}{6}$
5. A particle is at rest at a distance  $R$  (earth's radius) from the surface of earth. The minimum speed with which it should be projected so that it does not return, is
  - a)  $\sqrt{\frac{2GM}{R}}$
  - b)  $\sqrt{\frac{GM}{R}}$
  - c)  $\sqrt{\frac{GM}{2R}}$
  - d)  $\sqrt{\frac{GM}{4R}}$
6. A block, starting from rest, slides down an inclined plane of length  $L$  and inclination  $\alpha$ . The coefficient of friction between the block and plane is (almost) zero for the first half length of the plane and  $\mu$  for the second half length of the plane. If the block again comes to rest at the bottom of the plane, we have
  - a)  $\alpha = \tan^{-1}\mu$
  - b)  $\alpha = \tan^{-1}(\mu/2)$
  - c)  $\alpha = \tan^{-1}(\mu/3)$
  - d)  $\alpha = \tan^{-1}(\mu/4)$



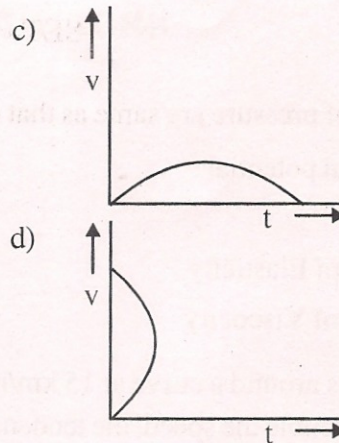
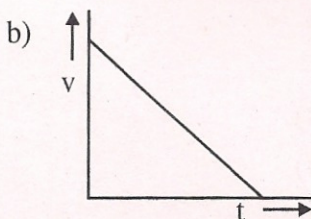
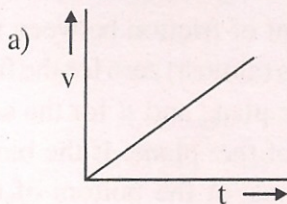
7. A particle is moving towards east with a velocity of 5 m/sec. In 10 seconds the velocity changes to 5 m/sec towards north. The acceleration in this time will be

- a)  $0.5 \text{ m/s}^2$  towards north-west
- b)  $0.5 \text{ m/s}^2$  towards north-east
- c)  $\frac{1}{\sqrt{2}} \text{ m/s}^2$  towards north
- d)  $\frac{1}{\sqrt{2}} \text{ m/s}^2$  towards north-west

8. A body is suspended by means of a string with the free end of a spring held vertically from a rigid support. The body is now placed in a liquid in a beaker and is found to float on the surface of the liquid. The elongation in the spring

- a) increases
- b) decreases
- c) becomes zero
- d) may increase or decrease depending on the densities of the body and the liquid

9. Which of the following cannot be the speed time graph?



10. A body of mass  $M$  just starts sliding down a rough inclined plane of inclination  $\theta$  such that  $\tan \theta = 0.5$ . The force of friction acting on the body is

- a)  $\frac{\sqrt{3}Mg}{2}$
- b)  $\frac{Mg}{2}$
- c)  $\frac{2Mg}{\sqrt{5}}$
- d)  $\frac{Mg}{\sqrt{5}}$

11. A particle, starting from rest, undergoes an acceleration that increases with time as per the relation :  $a = kt$ . The particle's velocity,  $n$  seconds after the start, and the distance moved by the particle, in these  $n$  seconds, are given, respectively, by

- a)  $v = \frac{1}{2}kn$ ;  $s = \frac{1}{4}kn^2$
- b)  $v = \frac{1}{2}kn^2$ ;  $s = \frac{1}{6}kn^3$
- c)  $v = \frac{1}{2}kn^3$ ;  $s = \frac{1}{12}kn^4$
- d)  $v = kn$ ;  $s = \frac{1}{2}kn^2$



12. A mercury drop of radius  $R$  has a surface energy of 8 J. The drop is sprayed into eight identical smaller drops. The surface energy of each smaller drop is
- 2 J
  - 1 J
  - 4 J
  - 16 J
13. A drop of radius 0.1 mm and density  $10 \text{ gm/cm}^3$  falls freely under gravity through a distance  $h$  before entering the water. After entering the water the velocity of the ball does not change. If  $g = 10 \text{ m/s}^2$ , what will be the value of  $h$ ? (The viscosity of water =  $10 \times 10^{-6} \text{ PI}$ )
- 10 m
  - 20 m
  - 40 m
  - 80 m
14. An elevator is rising at constant speed. Consider the following statements :
- the upward cable force is constant.
  - the kinetic energy of elevator is constant.
  - the acceleration of the elevator is zero.
  - the mechanical energy of the earth-elevator system is constant.
- All four are true
  - Only I, II and IV are true
  - Only III and IV are true
  - Only I, II and III are true
15. The temperature of the reservoir of a carnot engine having efficiency 70% is 1000 K. The temperature of the sink is
- 300 K
  - 400 K
  - 500 K
  - 700 K
16. A solid sphere of mass  $M$  and radius  $R$  is rotating with an angular frequency  $\omega$ . It suddenly stops rotating and 75% of K.E. is converted into heat. If 's' is specific heat of the material of the sphere, the rise in temperature of the sphere is
- $R^2 \omega^2 / 20s$
  - $3R^2 \omega^2 / 20s$
  - $R^2 \omega^2 / 4s$
  - $2R^2 \omega^2 / 20s$
17. The neutral temperature for a thermocouple is  $400^\circ\text{C}$ . If the temperature of cold junction is  $80^\circ\text{C}$  the inversion temperature will be
- $720^\circ\text{C}$
  - $800^\circ\text{C}$
  - $700^\circ\text{C}$
  - $480^\circ\text{C}$



18. If heat  $Q$  is added reversibly to a system at temperature  $T$  and heat  $Q'$  is taken away from it reversibly at temperature  $T'$ , then which one of the following is correct?
- $\frac{Q}{T} - \frac{Q'}{T'} = 0$
  - $\frac{Q}{T} - \frac{Q'}{T'} > 0$
  - $\frac{Q}{T} - \frac{Q'}{T'} < 0$
  - $\frac{Q}{T} - \frac{Q'}{T'} = \text{change in internal energy of the system}$
19. What is the minimum attainable pressure of an ideal gas in the process given by  $T = a + bV^2$ , where  $a, b$  are constants and  $V$  is the volume of one mole of ideal gas?
- $\sqrt{ab}$
  - $R\sqrt{ab}$
  - $2R\sqrt{ab}$
  - $\sqrt{a/b}$
20. The equation of motion of a particle executing simple harmonic motion is given by  $x = 2 \sin\left(\frac{\pi}{2}t + \frac{\pi}{4}\right)$  cm. It has maximum acceleration given by
- $\frac{\pi}{2} \text{ cm s}^{-2}$
  - $\pi \text{ cm s}^{-2}$
  - $\frac{\pi^2}{4} \text{ cm s}^{-2}$
  - $\frac{\pi^2}{2} \text{ cm s}^{-2}$
21. The displacement of a string carrying a travelling sinusoidal wave is given by  $y(x, t) = y_m \sin(kx - \omega t - \phi)$ . At time  $t = 0$  the point at  $x = 0$  has a velocity of zero and a positive displacement. The phase constant  $\phi$  is
- $45^\circ$
  - $135^\circ$
  - $180^\circ$
  - $270^\circ$
22. A sound wave of frequency  $f$  propagating through air with a velocity  $c$ , is reflected from a surface which is moving away from the source with a constant speed  $v$ . The frequency of the reflected wave, measured by the observer at the position of the source, is
- $f \frac{(c - v)}{(c + v)}$
  - $\frac{f(c + v)}{(c - v)}$
  - $\frac{f(c + 2v)}{(c + v)}$
  - $\frac{f(c - v)}{c - 2v}$
23. A lens is used to form an image of an object on a screen. The upper half of the lens is now covered and the light is transmitted only through the lower half of the lens then.
- the upper half of the image is only visible.
  - the lower half of the image is only visible.
  - the entire image vanishes.
  - the entire image will continue to be visible, though with reduced brightness.



24. The phase difference between the two waves which give rise to a dark spot in a Young's double-slit experiment is (where  $m$  is an integer)

- a) zero
- b)  $2m\pi + \frac{\pi}{8}$
- c)  $2m\pi + \frac{\pi}{4}$
- d)  $2m\pi + \pi$

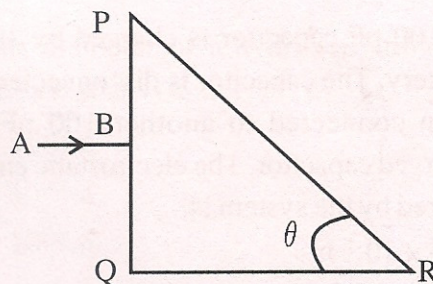
25. An erect object is  $2f$  in front of a convex lens of focal length  $f$ . The image is

- a) real, inverted, magnified
- b) virtual, inverted, reduced
- c) real, inverted, same size
- d) real, inverted, reduced

26. A single slit is used to observe diffraction pattern with red light. On replacing the red light with violet light the diffraction pattern would

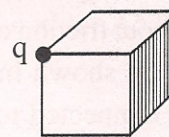
- a) remain unchanged
- b) become narrower
- c) become broader
- d) disappear

27. A right angled prism, PQR, is made from a material of refractive index  $\mu$ . A ray AB falls normally on the face PQ of the prism. The maximum value of the base angle,  $\theta$ , of this prism, up to which this ray will undergo total internal reflection, at the face PR, is given by the condition



- a)  $PQ = PR \cos \left[ \sin^{-1} \left( \frac{1}{\mu} \right) \right]$
- b)  $PQ = PR \sin \left[ \sin^{-1} \left( \frac{1}{\mu} \right) \right]$
- c)  $\theta_{\max} = \frac{\pi}{2} + \sin^{-1} \left( \frac{1}{\mu} \right)$
- d)  $\theta_{\max} = \frac{\pi}{2} + \cos^{-1} \left( \frac{1}{\mu} \right)$

28. A charge 'q' is placed at one corner of a cube of side 'a'. The flux through the face shown in figure is



- a)  $\frac{q}{4\epsilon_0}$
- b)  $\frac{q}{8\epsilon_0}$
- c)  $\frac{q}{12\epsilon_0}$
- d)  $\frac{q}{24\epsilon_0}$

29. Two metallic spherical shells A and B have radii  $2R$  and  $R$  respectively. If their surface charge densities are same, the ratio of electric fields on their surfaces  $E_A/E_B$  will be

- a) 4
- b) 2
- c) 1
- d)  $1/2$



30. A 100 pF capacitor is charged by 100 V battery. The capacitor is disconnected and then connected to another 100 pF uncharged capacitor. The electrostatic energy stored by the system is

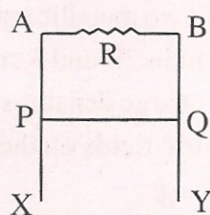
- a)  $5 \times 10^{-7} \text{ J}$
- b)  $2.5 \times 10^{-7} \text{ J}$
- c)  $5 \times 10^{-6} \text{ J}$
- d)  $2.5 \times 10^{-6} \text{ J}$

31. Two spherical conductors each of capacity C are charged to potential V and  $-V$ . These conductors are then connected by means of a fine wire. The loss of energy will be

- a)  $2 CV^2$
- b)  $\frac{1}{2} CV^2$
- c)  $CV^2$
- d) zero

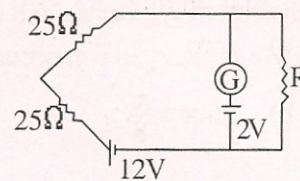
32. A wire PQ of length 'l', mass 'm' is sliding without friction on conducting rails AX and BY as shown in figure. The vertical rails are connected to one another via external resistance R. The entire circuit is placed in a region of space having a uniform magnetic field B, normally outward to plane of circuit. The steady speed of rod PQ is given as :

- a)  $\frac{mgR}{Bl}$
- b)  $\frac{mgR}{B^2 l^2}$
- c)  $\frac{mgR}{Bl^2}$
- d)  $\frac{mgR}{B^2 l}$



33. In the circuit shown, no current flows through the galvanometer. The value of resistance R is

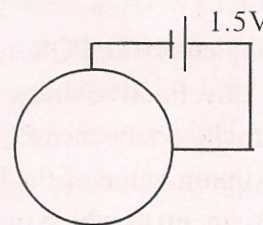
- a)  $5\Omega$
- b)  $10\Omega$
- c)  $6\Omega$
- d)  $\frac{25}{3}\Omega$



34. Four wires A, B, C and D of same material have their radii and lengths respectively as  $\left(\frac{r}{2}, \frac{l}{2}\right)$ ;  $(2r, 2l)$ ;  $\left(\frac{r}{2}, l\right)$ ;  $\left(\frac{r}{2}, 2l\right)$ . The resistance is

- a) equal for all the four wires
- b) maximum for D and minimum for C
- c) maximum for D and minimum for B
- d) minimum for B and maximum for A

35. A length of a uniform wire, of resistance  $12\Omega$ , is bent into a closed circle. A battery, of internal resistance  $0.75\Omega$  and Emf 1.5V, is connected across two points of the wire that are separated by a quarter of the circumference of the closed wire. The currents, in the shorter and longer segments of the wire, are then, respectively,



- a) 0.500 A and 0.167 A
- b) 0.375 A and 0.250 A
- c) 0.450 A and 0.150 A
- d) 0.375 A and 0.125 A



36. Which of the following is not property of the photons?

- a) Momentum
- b) Energy
- c) Frequency
- d) Rest mass

37. In a sinusoidal e.m. wave, the electric field oscillates at a frequency of  $2 \times 10^{10}$  Hz with an amplitude of  $36 \text{ Vm}^{-1}$ . The ratio of the average energy density of the electric and magnetic field is then

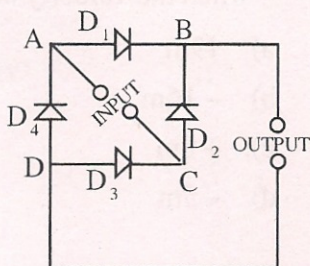
- a)  $\frac{36}{(2 \times 10^{10})}$
- b)  $\frac{(2 \times 10^{10})}{36}$
- c)  $\frac{36}{(3 \times 10^8)}$
- d) 1

38. If 10% of the atoms of a radioactive sample decay in 5 days, then the number of undecayed atoms left in the sample after 20 days will be nearly

- a) 60%
- b) 65%
- c) 73%
- d) 80%

39. The circuit shown in figure acts as

- a) full wave rectifier
- b) half wave rectifier
- c) amplifier
- d) oscillator

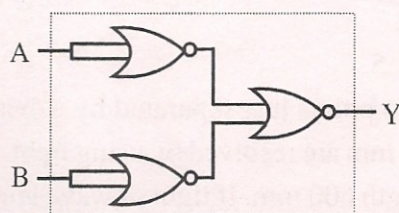


40. The diameter of a hydrogen atom in its ground state is about

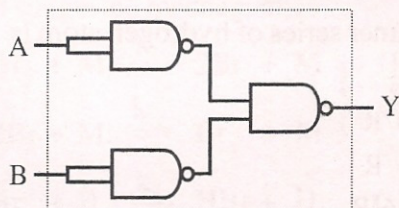
- a)  $10^{-13} \text{ m}$
- b)  $10^{-12} \text{ m}$
- c)  $10^{-10} \text{ m}$
- d)  $10^{-8} \text{ m}$

41. The two gate combinations, shown here, are

- a) both equivalent to an AND gate
- b) both equivalent to an OR gate



- c) equivalent to an AND and an OR gate respectively
- d) equivalent to an OR and an AND gate respectively



42. A satellite is orbiting around earth at a height 'h' above the earth's surface. If its kinetic energy is K, then its potential energy is

- a)  $-K$
- b)  $-2K$
- c)  $+K$
- d)  $+2K$



43. The rate of decay of a radioactive element
- is constant
  - decreases inversely with time
  - increases directly with time
  - decreases exponentially with time
44. For the same rise in temperature of one mole of a gas at constant volume, the heat required for triatomic gas is 'n' times that required for monatomic gas. The value of 'n' is
- 3
  - 2.5
  - 2
  - 1.5
45. Two points just separated by a distance of 0.1 mm are resolved by using light of wave length 600 nm. If light of wave length 480 nm is used the limit of resolution will be
- 0.08 mm
  - 0.10 mm
  - 0.12 mm
  - 0.125 mm
46. The wave length of the series limit line of Balmer series of hydrogen atom is
- $\frac{1}{R}$
  - $\frac{4}{R}$
  - $\frac{9}{R}$
  - $\frac{16}{R}$
47. All the particles of a body are situated at a distance R from the origin. The distance of the centre of mass of the body from the origin is
- $\leq R$
  - $= R$
  - $\geq R$
  - $> R$
48. An x-ray tube operates at an accelerating potential of 20 KeV. Which of the following wave length will be absent in continuous spectrum of x-ray? ( $h = 6.62 \times 10^{-34}$  Js)
- 50 pm
  - 72 pm
  - 65 pm
  - 94 pm
49. A series LCR circuit, with  $L = 12$  mH,  $C = \frac{16}{3}$  nF and  $R = 11.5 \Omega$ , is connected to a 230 V variable frequency AC source. The source frequency, at which the average power absorbed by the circuit is maximum, and the value of this maximum average power, are respectively
- $\frac{0.125}{2\pi}$  MHz and 4600 W
  - $\frac{0.125}{2\pi}$  MHz and 2300 W
  - $\frac{0.250}{2\pi}$  MHz and 4600 W
  - $\frac{0.250}{2\pi}$  MHz and 2300 W
50. A car is moving in a straight line. The variation of position with time is given by,  $x = 4t^3 - 16t + 3$  where (x) is in metres and (t) is in seconds. The displacement of car when the velocity becomes zero is
- 19m
  - 16m
  - +8m
  - 5m

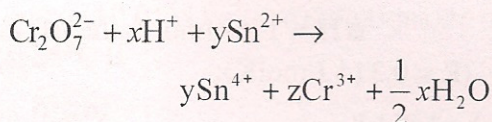


## SET - II (CHEMISTRY)

51. Total number of electrons present in 18 mL of water (Density of water = 1g/mL) is :

- a)  $6.02 \times 10^{23}$
- b)  $6.02 \times 10^{22}$
- c)  $6.02 \times 10^{24}$
- d)  $6.02 \times 10^{25}$

52. For the chemical equation,



The coefficients of x, y and z are respectively

- a) 14, 2, 3
- b) 12, 3, 2
- c) 14, 3, 2
- d) 12, 4, 3

53. Pi ( $\pi$ ) bonding is found in which of the following molecules/ions?

- (i)  $\text{N}_2$
- (ii)  $\text{CO}_3^{2-}$
- (iii)  $\text{ASH}_3$
- (iv) C (graphite)
- a) (i) and (ii)
- b) (ii), (iii) and (iv)
- c) (ii) and (iii)
- d) (i), (ii) and (iv)

54. An example of electron deficient compound is

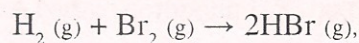
- a)  $\text{PCl}_3$
- b)  $\text{BCl}_3$
- c)  $\text{NH}_3$
- d)  $\text{ICl}$

55. For which of the given example(s), the entropy change is negative but the system(s) is (are) spontaneous?

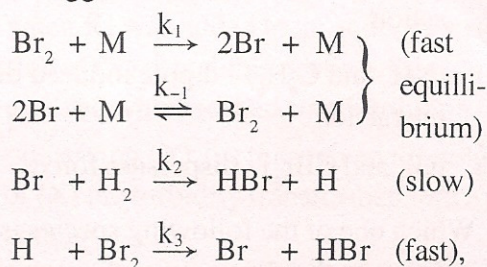
- (i) Rusting of iron
- (ii) Burning of L.P.G
- (iii) Cooling of nitrogen dioxide

- a) (i)
- b) (ii)
- c) (ii) and (iii)
- d) (i), (ii) and (iii)

56. For the reaction



if suggested mechanism is



the rate expression is

- a)  $\text{rate} = K_{\text{expt}} [\text{H}_2] [\text{Br}]$
- b)  $\text{rate} = K_{\text{expt}} [\text{H}_2] [\text{Br}_2]^{1/2}$
- c)  $\text{rate} = K_{\text{expt}} [\text{H}_2] [\text{Br}_2]^2$
- d)  $\text{rate} = K_{\text{expt}} [\text{H}_2] [\text{Br}]^{1/2}$



57. Equal number of molecules of oxygen and hydrogen taken in a 60L capacity container exert 1 bar pressure. Which of the following statement is **wrongly** stated for this system?
- Average speed of hydrogen molecules is faster than the oxygen molecules.
  - Pressure exerted by oxygen and hydrogen molecules is equal.
  - If oxygen molecules are **completely** removed from the container, the pressure drops to 0.25 bar
  - The average kinetic energy of oxygen and hydrogen molecules is the same.
58. Considering the intermolecular forces among the pairs mentioned in the parenthesis. Which of the following statements is **wrong**?
- (HBr and  $\text{H}_2\text{S}$ ) - dipole induced dipole interaction
  - ( $\text{I}_2$  and  $\text{NO}_3^-$ ) - ion-induced dipole interaction
  - ( $\text{NH}_3$  and  $\text{C}_6\text{H}_6$ ) - dipole induced dipole interaction
  - ( $\text{Cl}_2$  and  $\text{CBr}_4$ ) - dispersion forces
59. Which one of the following species is represented by the electronic configuration,  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$ ? (atomic number of Ni = 28 and Cu = 29)
- Ni
  - $\text{Ni}^{2+}$
  - $\text{Cu}^+$
  - $\text{Cu}^{2+}$
60. Rusting is most favoured in
- extremely dry conditions
  - distilled water
  - alkaline medium
  - saline water
61. At 1240K and 1 atmosphere pressure for the given reaction :
- $$\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g});$$
- $\Delta H = 176\text{kJmol}^{-1}$ , the  $\Delta U$  equals ( $R = 0.314 \text{ J/molK}$ ):
- 160 kJ
  - 165.7 kJ
  - 186.4 kJ
  - 180.0 kJ
62. Which of the following solutions will have highest boiling point?
- 1% solution of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )
  - 2% solution of urea ( $\text{NH}_2\text{CONH}_2$ )
  - 1% solution of sodium chloride ( $\text{NaCl}$ )
  - 2% solution of barium chloride ( $\text{BaCl}_2$ )
- |          |    |   |          |
|----------|----|---|----------|
| At. Mass | Ba | = | 137 amu  |
| -        | Cl | = | 35.5 amu |
| -        | Na | = | 23 amu   |
63. The solubility of  $\text{A}_2\text{X}_3$  is  $x \text{ mol L}^{-1}$ . Its solubility product is:
- $6x^4$
  - $64x^4$
  - $36x^5$
  - $108x^5$



64. For an endothermic reaction where entropy increases, the reaction is
- feasible when  $T\Delta S > \Delta H$
  - feasible when  $\Delta H > T\Delta S$
  - feasible at all temperatures
  - not feasible at all
65. The standard emf for the cell reaction,  $2\text{Cr(s)} + 3\text{Fe}^{2+}(\text{aq}) \rightarrow 2\text{Cr}^{3+}(\text{aq}) + 3\text{Fe(s)}$  is  $+0.30\text{V}$  at  $25^\circ\text{C}$ . The emf of the cell when  $0.1\text{M Cr}^{3+}(\text{aq})$  and  $0.01\text{M Fe}^{2+}(\text{aq})$  solutions are used at  $25^\circ\text{C}$  is
- $0.30\text{V}$
  - $-0.30\text{V}$
  - $0.260\text{V}$
  - $0.026\text{V}$
66. In which of the following pairs dipole - dipole interaction occurs?
- $\text{HBr}$  and  $\text{HF}$
  - $\text{CH}_4$  and  $\text{CS}_2$
  - $\text{Cl}^-$  and  $\text{CH}_4$
  - $\text{CCl}_4$  and  $\text{C}_6\text{H}_6$
67. For which of the following Dalton's law of partial pressure is not valid?
- $\text{N}_2(\text{g}) + \text{O}_2(\text{g})$
  - $\text{H}_2(\text{g}) + \text{O}_2(\text{g})$
  - $\text{NH}_3(\text{g}) + \text{HCl}(\text{g})$
  - $\text{CH}_4(\text{g}) + \text{H}_2\text{O}(\text{g})$
68. Among the following molecular ions the weakest bond is in
- $\text{O}_2^+$
  - $\text{O}_2^{2+}$
  - $\text{O}_2^-$
  - $\text{O}_2^{2-}$
69. Cuprous oxide,  $\text{Cu}_2\text{O}$  prepared in the laboratory is found to be non-stoichiometric and ratio of copper to oxygen is less than  $2 : 1$  and oxide formed is a p-type of semiconductor. This is because
- cuprous ion is good conductor of electricity
  - oxide ions move faster than cuprous ion,  $\text{Cu}^+$  in solid state
  - some Cu atoms remain unreacted during oxide formation
  - some  $\text{Cu}^+$  ions are replaced by  $\text{Cu}^{2+}$  ions creating positive holes.
70. Which one of the following species would have highest bond order?
- $\text{O}_2$
  - $\text{O}_2^+$
  - $\text{O}_2^{2+}$
  - $\text{O}_2^{2-}$
71. A certain compound (X) on chemical analysis gave the following results
- when  $\text{KI}$  was added to an aqueous suspension of (X) containing acetic acid, a gas was evolved which turned starch solution blue.
  - on passing  $\text{CO}_2(\text{g})$  through an aq. solution of (X) the turbidity transformed into a precipitate.
  - when an aq paste of (X) is heated with ethanol a product of anaesthetic use is obtained.
- The compound (X) may be
- $\text{CaOCl}_2$
  - $\text{CaCl}_2$
  - $\text{CaOBr}_2$
  - $\text{CaBr}_2$



72. Which of the following species is paramagnetic?

- a)  $[\text{Fe}(\text{CN})_6]^{4-}$
- b)  $[\text{Ni}(\text{CO})_4]$
- c)  $[\text{Ni}(\text{CN})_4]^{2-}$
- d)  $[\text{FeF}_6]^{3-}$

(At Nos. Fe = 26, N = 28)

73. Which one of the following statements is incorrect?

- a) State of hybridisation of nitrogen in  $\text{NO}_3^-$  ion is  $\text{sp}^3$
- b) Bond formed by  $\sigma$  - molecular orbitals are stronger than those by  $\lambda$  molecular orbitals
- c)  $\text{O}_2^-$  exhibits paramagnetism
- d) Order of increasing bond length of the species  $\text{O}_2$ ,  $\text{F}_2$  and  $\text{N}_2$  is  $\text{N}_2 < \text{O}_2 < \text{F}_2$

74. Aluminium chloride exists as a dimer in solid state but dissolves to give ions in aq solution due to formation of

- a)  $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$
- b)  $\text{Al}(\text{OH})_3$
- c)  $\text{AlCl}_3$
- d)  $(\text{Al}(\text{H}_2\text{O})_6)\text{Cl}_3$

75. Which of the following statements is not correct in case of hydrogen peroxide ( $\text{H}_2\text{O}_2$ )?

- a) Oxidising agent in acidic medium
- b) Oxidising agent in alkaline medium
- c) Reducing agent in alkaline medium but not in acidic medium
- d) Oxidising as well as reducing agent in both alkaline and acidic medium

76. In a decay series when  ${}_{90}^{232}\text{Th}$  changes to

${}_{82}^{208}\text{Pb}$ , the number of  $\alpha$  - and  $\beta$  - particles emitted are respectively

- a) 8, 6
- b) 6, 8
- c) 6, 6
- d) 6, 4

77. The  $\frac{d}{2}$  electron configurations of  $\text{Cr}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Fe}^{2+}$  and  $\text{Co}^{2+}$  are  $3d^4$ ,  $3d^5$ ,  $3d^6$  and  $3d^7$  respectively. Which one of the following aqua complex ions will exhibit the minimum paramagnetic behaviour?

- a)  $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$
- b)  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$
- c)  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
- d)  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$

78. The  $p\pi - d\pi$  type of lateral overlap is present in the structure of which of the following ions?

- a)  $\text{PO}_4^{3-}$
- b)  $\text{BO}_3^{3-}$
- c)  $\text{CO}_3^{2-}$
- d)  $\text{NO}_3^-$

79. How many hybrid orbitals are associated with the central atom of hydronium ion?

- a) Two
- b) Three
- c) Four
- d) Five



80. Which one of the following sequences represents the correct order of the increasing first ionization enthalpy of the elements of the second period of the periodic table?

- a)  $\text{Be} < \text{N} < \text{C} < \text{O}$
- b)  $\text{C} < \text{Be} < \text{O} < \text{N}$
- c)  $\text{N} < \text{O} < \text{Be} < \text{C}$
- d)  $\text{Be} < \text{C} < \text{O} < \text{N}$

81. The number of P-O-P bonds in cyclic metaphosphoric acid is :

- a) zero
- b) two
- c) three
- d) four

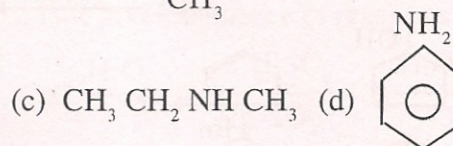
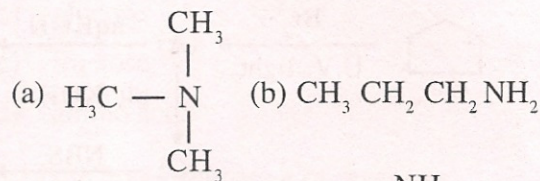
82. The end product of (un+2) disintegration series is :

- a)  $^{204}_{82}\text{Pb}$
- b)  $^{208}_{82}\text{Pb}$
- c)  $^{209}_{82}\text{Pb}$
- d)  $^{206}_{82}\text{Pb}$

83. The order of ability of ligands to cause the splitting of d-orbitals into  $t_{2g}$  and  $e_g$  in an octahedral field is :

- a)  $\text{I}^- > \text{CO} > \text{CN}^- > \text{OH}^-$
- b)  $\text{CO} > \text{OH}^- > \text{CN}^- > \text{I}^-$
- c)  $\text{CO} > \text{CN}^- > \text{OH}^- > \text{I}^-$
- d)  $\text{CN}^- > \text{OH}^- > \text{CO} > \text{I}^-$

84. The correct order of basicity of the following amines in solutions is



- a)  $a > b > c > d$
- b)  $c > b > d > a$
- c)  $d > c > a > b$
- d)  $d > a > b > c$

85. If radius of  $\text{Rb}^+ = 1.475 \times 10^{-10}\text{m}$  and that of  $\text{I}^- = 2.165 \times 10^{-10}\text{m}$ , then lattice type of  $\text{RbI}$  is,

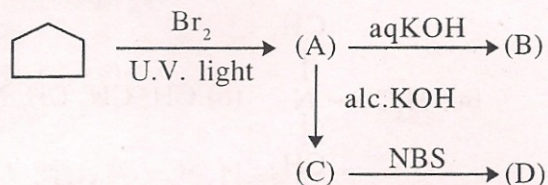
- a)  $\text{B}_2\text{O}_3$
- b)  $\text{ZnS}$
- c)  $\text{NaCl}$
- d)  $\text{CsCl}$


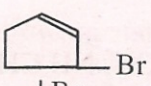

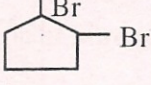

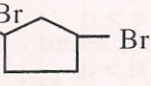

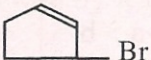
86. Which of the following statements is NOT true about glucose?

- a) It forms  $c_1$  anomers
- b) It undergoes mutarotation
- c) One mol. of glucose reacts with three moles of phenyl-drazine
- d) In the ring formation  $c_1$  and  $c_6$  are involved forming a six membered ring.



87. Identify the unknown organic compounds (B) and (D) in the following series of chemical reactions



- a)  ,   
 b)  ,   
 c)  ,   
 d)  , 

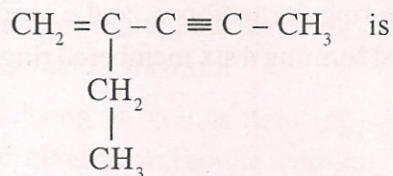
88. Benzyl alcohol is obtained from benzaldehyde by

- a) Fittig's reaction  
 b) Cannizzaro's reaction  
 c) Kolbe's reaction  
 d) Wurtz reaction

89. Which of the following can be used to differentiate acetophenone and benzophenone?

- a) Tollen's reagent  
 b)  $\text{NaHSO}_3$   
 c)  $\text{NaOH} + \text{I}_2$   
 d) Fehling solution

90. IUPAC name of the compound

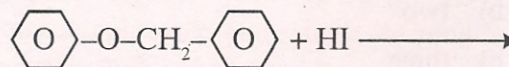


- a) 4-ethylpent-1-ene-2-yne  
 b) 2-ethylpent-1-ene-3-yne  
 c) 4-methylenehex-2-yne  
 d) 3-methylenehex-4-yne

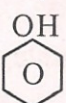
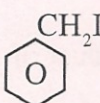

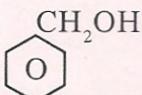

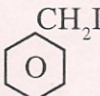

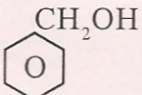
91. The vitamin which is neither soluble in fat nor in water is

- a) vitamin A (Retinol)  
 b) vitamin E ( $\alpha$ -tocophene)  
 c) vitamin K (Phylloquinone)  
 d) vitamin H (Biotin)

92. In the reaction :



The product will be

- a)  and   
 b)  and   
 c)  and   
 d)  and 

93. Which one of the following is not a monopropellant?

- a) Liquid oxygen  
 b) Hydrogen peroxide  
 c) Hydrazine  
 d) Nitroethane



94. Clemmensen reduction of a ketone is carried out in the presence of

- a)  $H_2$  with Pt as catalyst
- b) Glycol in presence of KOH
- c)  $LiAlH_4$
- d) Zn-Hg in the presence of HCl

95. Excess of  $Na^+$  ions in human system causes :

- a) diabetes
- b) anaemia
- c) low blood pressure
- d) high blood pressure

96. Tautomerism is exhibited by

- a)  $(CH_3)_3C - NO$
- b)  $(CH_3)_2NH$
- c)  $R_3C - NO_2$
- d)  $R - CH_2 - NO_2$

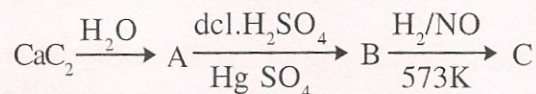
97. In which of the following chemical reactions ether will not be produced?

- a)  $CH_3 - CH_2 - CH_2Cl + CH_3CH_2ONa \longrightarrow$
- b)  $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - Cl + CH_3 - \underset{\substack{| \\ CH_3}}{CH} - ONa \longrightarrow$
- c)  $CH_3 - \underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}} - Cl + CH_3 - \underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}} - ONa \longrightarrow$
- d)  $CH_3CH_2Cl + CH_3 - \underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}} - ONa \longrightarrow$

98. The end product of protein digestion is

- a) glycerol
- b) glucose
- c) fructose
- d) amino acid

99. In the given sequence of reactions



the end product (C) is :

- a) methanal
- b) ethanal
- c) ethene
- d) ethanol

100. IUPAC name of  $(CH_3)_3N$  is :

- a) Trimethyl amine
- b) N-methylethanamine
- c) N, N-dimethyl methanamine
- d) N-methyl methanamine