Mission Admission Seminar Schedule

Corporate Office : Pearl Centre, Senapati Bapat Marg. Dadar (W) Tel.: 4232 42 32 : 7045 018 539

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MHT-CET 2018

Question Booklet Version
44

PAPER– II : PHYSICS & CHEMISTRY

Instruction to Candidates

1. This question booklet contains 100 Objective Type Question (Multiple Choice Questions (MCQ) in the subjects of Physics (50) & Chemistry (50).
2. The question paper and OMR (Optical Mark Reader) Answer Sheet is issued separately at the start of the examination.
3. Choice and sequence for attempting questions will be as per the convenience of the candidate.
4. Candidate should carefully read the instructions printed on the Question Booklet and Answer Sheet and make the correct entries on the Answer Sheet. As Answer Sheets are designed to suit the OPTICAL MARK READER (OMR) SYSTEM, special care should be taken to mark the entries correctly. Special care should be taken to fill QUESTION BOOKLET VERSION, SERIAL No. and MH-CET Roll No. accurately. The correctness of entries has to be cross-checked by the invigilators. **The candidate must sign on the Answer Sheet and Question Booklet**.
5. Read each question carefully.
6. Determine the one correct answer out of the four available options given for each question.
7. Fill the appropriate circle completely like this •, for answering a particular question. Mark with Black ink ball point pen only.
8. **Each question with correct response shall be awarded one (1) mark. There shall be no negative marking. No mark shall be granted for marking two or more answers of same question, scratching or overwriting.**
9. **Use of whitener or any other material to erase / hide the circle once filled is not permitted.**
10. Avoid overwriting and / or striking of answers once marked.
11. Rough work should be done only on the blank space provided on the Question Booklet. **Rough work should not be done on the Answer Sheet**.
12. The required mathematical tables (Log etc.) is provided along with the question booklet.
13. Immediately after the prescribed examination time is over, the Question Booklet and Answer sheet is to be returned to the Invigilator. Confirm that both the Candidate and Invigilator have signed on question booklet and answer sheet.
14. No candidate is allowed to leave the examination hall till the end of examination.

PHYSICS

1. The path length of oscillation of simple pendulum of length 1 metre is 16 cm. Its maximum velocity is ($g = \pi^2$ m/s^2)

(A) 2π cm/s (B) 4π cm/s (C) 8π cm/s (D) 16π cm/s

1. (C)

$T = 2\pi\sqrt{\frac{\ell}{g}}, \qquad \omega = \frac{2\pi}{T} = \sqrt{\frac{g}{\ell}} = \sqrt{\frac{\pi^2}{1}} = \pi$

$A = \frac{16}{2} = 8\,\text{cm}$

Maximum velocity $V_{max} = A\omega = 8\pi$ cm/s

2. A vessel completely filled with water has holes 'A' and 'B' at depths 'h' and '3h' from the top respectively. Hole 'A' is a square of side 'L' and 'B' is circle of radius 'r'. The water flowing out per second from both the holes is same. Then 'L' is equal to

(A) $r^{\frac{1}{2}}(\pi)^{\frac{1}{2}}(3)^{\frac{1}{2}}$ (B) $r\cdot(\pi)^{\frac{1}{4}}(3)^{\frac{1}{4}}$ (C) $r\cdot(\pi)^{\frac{1}{2}}(3)^{\frac{1}{4}}$ (D) $r^{\frac{1}{2}}\cdot(\pi)^{\frac{1}{3}}(3)^{\frac{1}{2}}$

2. (C)

Velocity of efflux for A : $\upsilon_A = \sqrt{2gh}$

Velocity of efflux for B : $\upsilon_B = \sqrt{2g\times 3h} = \sqrt{6gh}$

Water flowing out from A = Water flowing out from B

$\upsilon_A \times (\text{Area of A}) = \upsilon_B (\text{Area of B})$

$\sqrt{2gh}\times L^2 = \sqrt{6gh}\times \pi r^2$

$\therefore \qquad L^2 = \frac{\sqrt{6gh}}{\sqrt{2gh}}\cdot \pi r^2 = \sqrt{3}\pi r^2$

$L = 3^{\frac{1}{4}}\cdot\pi^{\frac{1}{2}}\cdot r = r\cdot(\pi)^{\frac{1}{2}}\cdot(3)^{\frac{1}{4}}$

3. A transistor is used as a common emitter amplifier with a load resistance 2 KΩ. the input resistance is 150 Ω. Base current is changed by 20 μA which results in a change in collector current by 1.5 mA. The voltage gain of the amplifier is

(A) 900 (B) 1000 (C) 1100 (D) 1200

3. (B)

Voltage gain = (Resistance gain) × (current gain)

$= \frac{R_L}{R_i}\cdot\frac{\Delta I_C}{\Delta I_B}$

$= \frac{2000}{150}\cdot\frac{1.5\times10^{-3}}{20\times10^{-6}}$

$= 1000$

4. A disc has mass 'M' and radius 'R'. How much tangential force should be applied to the rim of the disc so as to rotate with angular velocity 'ω' in time 't'?

(A) $\frac{MR\omega}{4t}$ (B) $\frac{MR\omega}{2t}$ (C) $\frac{MR\omega}{t}$ (D) $MR\omega t$

4. (B)

$\alpha = \frac{\omega}{t}$

Torque $\tau = I\alpha = \frac{MR^2}{2} \cdot \frac{\omega}{t}$

$= \frac{MR^2\omega}{2t}$

Force = $F = \frac{\tau}{R} = \frac{MR\omega}{2t}$

5. A circular coil carrying current 'I' has radius 'R' and magnetic field at the centre is 'B'. At what distance from the centre along the axis of the same coil, the magnetic field will be $\frac{B}{8}$?

(A) $R\sqrt{2}$ (B) $R\sqrt{3}$ (C) 2R (D) 3R

5. (B)

Magnetic field at the centre : $B = \frac{\mu_0 nI}{2R}$

Magnetic field at the axial point : $B_{axis} = \frac{\mu_0 nIR^2}{2(R^2 + x^2)^{3/2}}$

$B_{axis} = \frac{B}{8}$

$\frac{\mu_0 nIR^2}{2(R^2 + x^2)^{3/2}} = \frac{\mu_0 nI}{16R}$

$\therefore \quad \frac{R^2}{2(R^2 + x^2)^{3/2}} = \frac{1}{16R}$

$\therefore \quad 2(R^2 + x^2)^{3/2} = 16R^3$

$(R^2 + x^2)^{3/2} = 8R^3$

$(R^2 + x^2)^{1/2} = 2R$

$R^2 + x^2 = 4R^2$

$\therefore \quad x^2 = 3R^2$

$\therefore \quad x = \sqrt{3}R$

6. Two light waves of intensities 'I_1' and 'I_2' having same frequency pass through same medium at a time in same direction and interfere. The sum of the minimum and maximum intensities is

(A) $(I_1 + I_2)$ (B) $2(I_1 + I_2)$ (C) $\left(\sqrt{I_1} + \sqrt{I_2}\right)$ (D) $\left(\sqrt{I_1} - \sqrt{I_2}\right)$

6. (B)

The amplitudes are $\sqrt{I_1}$ and $\sqrt{I_2}$

Maximum amplitude $A_{max} = \sqrt{I_1} + \sqrt{I_2}$

Maximum intensity $I_{max} = \left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

Minimum amplitude $A_{min} = \sqrt{I_1} - \sqrt{I_2}$

Minimum intensity $I_{max} = \left(\sqrt{I_1} - \sqrt{I_2}\right)^2$

$\therefore \quad I_{max} + I_{min} = \left(\sqrt{I_1} + \sqrt{I_2}\right)^2 + \left(\sqrt{I_1} - \sqrt{I_2}\right)^2$

$= 2(I_1 + I_2)$

7. An alternating voltage $e = 200\sqrt{2}\sin(100\ t)$ volt is connected to 1 μF capacitor through a.c. ammeter. The reading of ammeter is

(A) 5 mA (B) 10 mA (C) 15 mA (D) 20 mA

7. (D)

$e = 200\sqrt{2}\sin(100\,t)$ volt

$\omega = 100$ rad/s, $C = 2\ \mu F = 10^{-6}$ F

Capacitive reactance $X_C = \frac{1}{\omega C} = \frac{1}{100\times10^{-6}} = 10^{-4}\Omega$

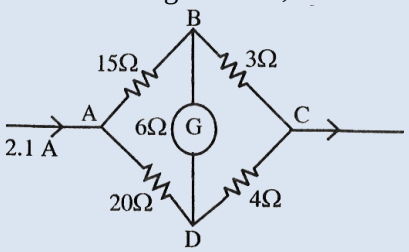
$$i = \frac{e}{X_C}$$

$$i = \frac{200\sqrt{2}\sin(100t)}{10^4}$$

$$i_0 = 2\sqrt{2}\times10^{-2}\,A$$

$$i_{rms} = \frac{i_0}{\sqrt{2}} = 2\times10^{-2}\,A = 20\ mA$$

8. In the following network, the current flowing through 15 Ω resistance is

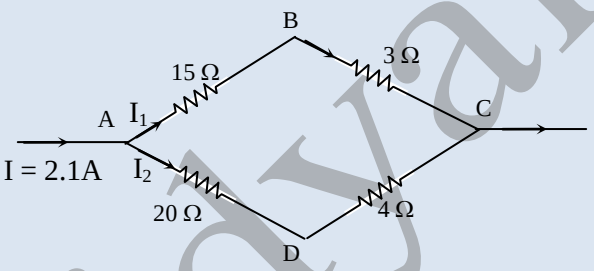


(A) 0.8 A (B) 1.0 A (C) 1.2 A (D) 1.4 A

8. (C)

It is a balanced Wheatstone network. No current flows through the galvanometer

The circuit can be drawn as :



$\therefore\ I_1 \times 18 = I_2 \times 24$

or $3I_1 = 4I_2$ $\therefore\ I_2 = \frac{3}{4}I_1$

Also $I_1 + I_2 = 2.1$

$$I_1 + \frac{3}{4}I_1 = 2.1$$

$$\frac{7}{4}I_1 = 2.1$$

$$I_1 = \frac{2.1\times4}{7} = 1.2\ A$$

9. The angle made by incident ray of light with the reflecting surface is called

(A) glancing angle (B) angle of incidence (C) angle of deviation (D) angle of refraction

9. (A)

10. In non uniform circular motion, the ratio of tangential to radial acceleration is (r = radius of circle, v = speed of the particle, α = angular acceleration)

(A) $\frac{\alpha^2 r^2}{v}$ (B) $\frac{\alpha^2 r}{v^2}$ (C) $\frac{\alpha r^2}{v^2}$ (D) $\frac{v^2}{r^2\alpha}$

10. (C)

$a_t = r\alpha$

$a_r = \frac{\upsilon^2}{r}$

$\therefore \quad \frac{a_t}{a_r} = \frac{r\alpha}{\left(\frac{\upsilon^2}{r}\right)} = \frac{\alpha r^2}{\upsilon^2}$

11. If numerical aperture of a microscope is increased then its

(A) resolving power remains constant (B) resolving power becomes zero

(C) limit of resolution is decreased (D) limit of resolution is increased

11. (C)

12. In amplitude modulation

(A) amplitude remains constant but frequency changes

(B) both amplitude and frequency do not change

(C) both amplitude and frequency change

(D) amplitude of the carrier wave changes according to information signal

12. (D)

13. If M_z = magnetization of a paramagnetic sample, B = external magnetic field, T = absolute temperature, C = curie constant then according to Curie's law in magnetism, the correct relation is

(A) $M_z = \frac{T}{CB}$ (B) $M_z = \frac{CB}{T}$ (C) $C = \frac{M_z B}{T}$ (D) $C = \frac{T^2}{M_z B}$

13. (B)

14. An electron of stationary hydrogen atom jumps from 4^{th} energy level to ground level. The velocity that the photon acquired as a result of electron transition will be (h = Planck's constant, R = Rydberg's constant, m = mass of photon)

(A) $\frac{9Rh}{16m}$ (B) $\frac{11hR}{16m}$ (C) $\frac{13hR}{16m}$ (D) $\frac{15hR}{16m}$

14. (D)

$\frac{1}{\lambda} = R\left(\frac{1}{n^2} - \frac{1}{p^2}\right) = R\left(\frac{1}{1^2} - \frac{1}{4^2}\right)$

$= R\left(1 - \frac{1}{16}\right) = \frac{15}{16}R$

$E = h\nu = h\frac{c}{\lambda} = hcR\frac{15}{16}$

$mc^2 = hcR\frac{15}{16}$

$c^2 = \frac{15hRc}{16m}$

$c = \frac{15hR}{16\,m}$

15. A metal wire of density 'ρ' floats on water surface horizontally. If it is NOT to sink in water then maximum radius of wire is proportional to (T = surface tension of water, g =gravitational acceleration)

(A) $\sqrt{\frac{T}{\pi\rho g}}$ (B) $\sqrt{\frac{\pi\rho g}{T}}$ (C) $\frac{T}{\pi\rho g}$ (D) $\frac{\pi\rho g}{T}$

15. (A)

$\pi r^2 \cdot L \cdot \rho \cdot g = LT$ [L – length of the wire]

$r^2 = \frac{T}{\pi\rho g}$

$r = \sqrt{\frac{T}{\pi\rho g}}$

16. A sphere of mass 'm' moving with velocity 'v' collides head-on on another sphere of same mass which is at rest. The ratio of final velocity of second sphere to the initial velocity of the first sphere is (e is coefficient of restitution and collision is inelastic)

(A) $\frac{e-1}{2}$ (B) $\frac{e}{2}$ (C) $\frac{e+1}{2}$ (D) e

16. (C)

$e = \frac{\upsilon_2 - \upsilon_1}{u_1 - u_2}$ $\frac{\upsilon_2}{v} = ?$

$u_1 = v, u_2 = 0$

$e = \frac{\upsilon_2 - \upsilon_1}{v} = \frac{\upsilon_2}{v} - \frac{\upsilon_1}{v}$ …(1)

By law of conservation of momentum:

$mv = m\upsilon_1 + m\upsilon_2$

$v = \upsilon_1 + \upsilon_2$

$1 = \frac{\upsilon_1}{v} + \frac{\upsilon_2}{v}$

$\therefore \quad \frac{\upsilon_1}{v} = 1 - \frac{\upsilon_2}{v}$ …(2)

Putting in equation (1) : $e = \frac{\upsilon_2}{v} - \left(1 - \frac{\upsilon_2}{v}\right)$

$\therefore \quad e = \frac{\upsilon_2}{v} - 1 + \frac{\upsilon_2}{v}$

$e = \frac{2\upsilon_2}{v} - 1$

$\therefore \quad \frac{2\upsilon_2}{v} = e + 1 \qquad \therefore \quad \frac{\upsilon_2}{v} = \frac{e+1}{2}$

17. For a particle performing linear S.H.M., its average speed over one oscillation is (a = amplitude of S.H.M., n = frequency of oscillation)

(A) 2 an (B) 4 an (C) 6 an (D) 8 an

17. (B)

Total distance = 4a

Total time = $\frac{1}{n}$

Average speed = $\frac{4a}{\left(\frac{1}{n}\right)} = 4an$

18. An ideal transformer converts 220 V a.c. to 3.3 kV a.c. to transmit a power of 4.4 kW. If primary coil has 600 turns, then alternating current in secondary coil is

(A) $\frac{1}{3}$ A (B) $\frac{4}{3}$ A (C) $\frac{5}{3}$ A (D) $\frac{7}{3}$ A

18. (B)

$V_p = 220$ V, $V_s = 3.3 \times 10^3$ V

$N_p = 600$, $P = 4.4 \times 10^3$ W

$P = V_S I_s$

$\therefore \quad I_s = \frac{P}{V_s} = \frac{4.4 \times 10^3}{3.3 \times 10^3} = \frac{4}{3}$ A

19. A conducting wire has length 'L_1' and diameter 'd_1'. After stretching the same wire length becomes 'L_2' and diameter 'd_2'. The ratio of resistances before and after stretching is

(A) $d_2^4 : d_1^4$ (B) $d_1^4 : d_2^4$ (C) $d_2^2 : d_1^2$ (D) $d_1^2 : d_2^2$

19. (A)

$R = \rho \frac{L}{A}$

$A = \pi \frac{d^2}{4}$

$v = A\ell$

$\ell_1 = \frac{V}{A_1}$

$$\therefore \frac{R_1}{R_2} = \frac{\ell_1}{A_1} \times \frac{A_2}{\ell_2} = \frac{\ell_1}{\ell_2} \times \frac{A_2}{A_1} = \frac{\ell_1}{\ell_2} \times \frac{d_2^2}{d_1^2}$$

$$= \frac{V}{A_1} \times \frac{A_2}{V} \times \frac{d_2^2}{d_1^2} = \frac{d_2^2}{d_1^2} \times \frac{d_2^2}{d_1^2} = \frac{d_2^4}{d_1^4}$$

20. The molar specific heat of an ideal gas at constant pressure and constant volume is 'C_p' and 'C_v' respectively. If 'R' is the universal gas constant and the ratio of 'C_p' to 'C_v' is 'γ' then C_v =

(A) $\frac{1-\gamma}{1+\gamma}$ (B) $\frac{1+\gamma}{1-\gamma}$ (C) $\frac{\gamma-1}{R}$ (D) $\frac{R}{\gamma-1}$

20. (D)

$\frac{C_P}{C_V} = \gamma$

$\frac{C_P - C_V}{C_V} = \frac{\gamma - 1}{1}$

$\frac{R}{C_V} = \gamma - 1$

$C_V = \frac{R}{\gamma - 1}$

21. In a capillary tube having area of cross-section 'A', water rises to a height 'h'. If cross-sectional area is reduced to $\frac{'A'}{9}$, the rise of water in the capillary tube is

(A) 4h (B) 3h (C) 2h (D) h

21. (B)

$h = \dfrac{2T\cos\theta}{r\rho g}$

$h \propto \dfrac{1}{r}$ $\qquad A = \pi r^2$

$h_1 r_1 = h_2 r_2$ $\qquad \sqrt{A} \propto r$

$\dfrac{h_1}{h_2} = \dfrac{r_2}{r_1} = \sqrt{\dfrac{A_2}{A_1}} = \sqrt{\dfrac{A/g}{A}} = \dfrac{1}{3}$

22. With forward biased mode, the p–n junction diode
(A) is one in which width of depletion layer increases.
(B) is one in which potential barrier increases
(C) acts as closed switch
(D) acts as open switch

22. (C)

23. An alternating electric field of frequency 'ν' is applied across the dees (radius R) of a cyclotron to accelerate protons (mass m). The operating magnetic field 'B' used and K.E. of the proton beam produced by it are respectively (e = charge on proton)

(A) $\dfrac{2\pi m\nu}{e}, 2\pi^2 m\nu^2 R^2$ (B) $\dfrac{2\pi^2 m\nu}{e^2}, 4\pi^2 m\nu^2 R^2$

(C) $\dfrac{\pi m\nu}{e}, \pi^2 m\nu^2 R^2$ (D) $\dfrac{2\pi^2 m^2\nu^2}{e}, 2\pi^2 m^2\nu^2 R^2$

23. (A)

$evB = \dfrac{mv^2}{R}$

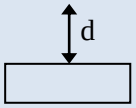
$\therefore B = \dfrac{mv}{eR} = \dfrac{m\omega}{q} = \dfrac{m \times 2\pi\nu}{e} = \dfrac{2\pi m\nu}{e}$

$K.E. = \dfrac{1}{2}mv_{max}^2 = \dfrac{1}{2}mR\omega^2 = \dfrac{1}{2}mR\left(4\pi^2\nu^2\right)$

$= 2mR^2\pi^2\nu^2$

24. A ray of light is incident normally on a glass slab of thickness 5 cm and refractive index 1.6. The time taken to travel by a ray from source to surface of slab is same as to travel through glass slab. The distance of source from the surface is
(A) 4 cm (B) 8 cm (C) 12 cm (D) 16 cm

24. (B)
t = 5 cm
μ = 1.6
d = μt = 5 × 1.6 = 8.0 cm



25. A string is vibrating in its fifth overtone between two rigid supports 2.4 m apart. The distance between successive node and antinode is
(A) 0.1 m (B) 0.2 m (C) 0.6 m (D) 0.8 m

25. (B)
In fifth overtone the string is vibrating forming 6 loops.
∴ length of 6 loops is 2.4 m

$\therefore$ length of 1 loop is $\frac{2.4}{6} = 0.4\,\text{m}$

$\therefore$ Distance between a node and antinode is half of loop length i.e. $\frac{0.4}{2} = 0.2\,\text{m}$.

26. If $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{C} = 2\hat{i} + \hat{j} - 4\hat{k}$ form a right angled triangle then out of the following which one is satisfied?

(A) $\vec{A} = \vec{B} + \vec{C}$ and $A^2 = B^2 + C^2$ (B) $\vec{A} = \vec{B} + \vec{C}$ and $B^2 = A^2 + C^2$

(C) $\vec{B} = \vec{A} + \vec{C}$ and $B^2 = A^2 + C^2$ (D) $\vec{B} = \vec{A} + \vec{C}$ and $A^2 = B^2 + C^2$

26. (B)

$A = 3\hat{i} - 2\hat{j} + \hat{k}$ $\quad A = \sqrt{9+4+1} = \sqrt{14}$

$B = \hat{i} - 3\hat{j} + 5\hat{k}$ $\quad B = \sqrt{1+9+25} = \sqrt{35}$

$C = 2\hat{i} + \hat{j} - 4\hat{k}$ $\quad C = \sqrt{4+1+16} = \sqrt{21}$

$B^2 = A^2 + C^2$

$\vec{A} = \vec{B} + \vec{C}$

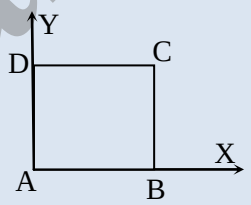
27. A square frame ABCD is formed by four identical rods each of mass 'm' and length 'l' This frame is in X–Y plane such that side AB coincides with X-axis and side AD along Y-axis. The moment of inertia of the frame about X-axis is

(A) $\frac{5ml^2}{3}$ (B) $\frac{2ml^2}{3}$ (C) $\frac{4ml^2}{3}$ (D) $\frac{ml^2}{12}$

27. (A)

$I_{AB} = 0;\ I_{AD} = I_{BC} = \frac{m\ell^2}{3};\ I_{DC} = m\ell^2$

$\therefore$ Total moment of inertia = $I = 2\frac{m\ell^2}{3} + m\ell^2 = \frac{5}{6}m\ell^2$



28. A unit vector is represented as $(0.8\,\hat{i} + b\hat{j} + 0.4\hat{k})$. Hence the value of 'b' must be

(A) 0.4 (B) $\sqrt{0.6}$ (C) 0.2 (D) $\sqrt{0.2}$

28. (D)

$0.8\hat{i} + b\hat{j} + 0.4\hat{k}$ is a unit vector

$\therefore \sqrt{(0.8)^2 + b^2 + (0.4)^2} = 1$

$0.69 + b^2 + 0.16 = 1$

$0.80 + b^2 = 1$

$b^2 = 1 - 0.8 = 0.2$

$b = \sqrt{0.2}$

29. Magnetic susceptibility for a paramagnetic and diamagnetic materials is respectively

(A) small, positive and small, positive (B) large, positive and small, negative

(C) small, positive and small, negative (D) large, negative and large, positive

29. (C)

30. A mass is suspended from a vertical spring which is executing S.H.M. of frequency 5Hz. The spring is upstretched at the highest point of oscillation. Maximum speed of the mass is [acceleration due to gravity $g = 10\ \text{m/s}^2$]

(A) 2π m/s (B) π m/s (C) $\frac{1}{2\pi}$ m/s (D) $\frac{1}{\pi}$ m/s

30. (D)

$f = 5$ Hz, $T = \frac{1}{5}$ s

$T = 2\pi\sqrt{\frac{m}{K}}$

$Kx = mg$ [x is the amplitude]

$\therefore \frac{m}{K} = \frac{x}{g}$

$\therefore T = 2\pi\sqrt{\frac{x}{g}}$

$\frac{1}{5} = 2\pi\sqrt{\frac{x}{g}}$

$\frac{1}{25} = 4\pi^2 \cdot \frac{x}{g}$

$\therefore \quad x = \frac{g}{100\pi^2} = \frac{10}{100\pi^2} = \frac{1}{10\pi^2}$

$\therefore \quad v_{max} = x\omega = x \times 2\pi f$

$= \frac{1}{100\pi^2} \times 2\pi \times 5 = \frac{1}{\pi}$

31. The moment of inertia of a ring about an axis passing through the centre and perpendicular to its plane is 'I'. It is rotating with angular velocity 'ω'. Another identical ring is gently placed on it so that their centres coincide. If both the rings are rotating about the same axis then loss in kinetic energy is

(A) $\frac{I\omega^2}{2}$ (B) $\frac{I\omega^2}{4}$ (C) $\frac{I\omega^2}{6}$ (D) $\frac{I\omega^2}{8}$

31. (B)

$I_1\omega_1 = I_2\omega_2 = 2I_1\omega_2$

$\therefore \quad \omega_2 = \frac{I_1\omega_1}{2I_1} = \frac{\omega_1}{2}$

$\therefore \quad KE_1 = \frac{1}{2}I\omega^2$

$KE_2 = \frac{1}{2}(2I)\frac{\omega^2}{4} = \frac{I\omega^2}{4}$

$\therefore \quad KE_1 - KE_2 = \frac{1}{2}I\omega^2\left[1 - \frac{1}{2}\right] = \frac{1}{2}I\omega^2 \times \frac{1}{2} = \frac{I\omega^2}{4}$

32. A bomb at rest explodes into 3 parts of same mass. The momentum of two parts is $-3p\hat{i}$ and $2P\hat{j}$ respectively. The magnitude of momentum of the third part is

(A) P (B) $\sqrt{5}$ P (C) $\sqrt{11}$ P (D) $\sqrt{13}$ P

32. (D)

$P_A = -3Pi$

$P_B = 2Pj$

$P_A + P_B + P_C = 0$

$\therefore \quad -2Pi + 2Pj + P_C = 0$

$\therefore \quad P_C = 2Pi - 2Pj$

$\therefore \quad P_C = 3Pi - 2Pj$

$\therefore \quad |P_C| = \sqrt{9P^2 + 4P^2} = \sqrt{13}P$

33. In a photocell, frequency of incident radiation is increased by keeping other factors constant ($\nu > \nu_0$), the stopping potential

(A) decreases (B) increases

(C) becomes zero (D) first decreases and then increases.

33. (B)

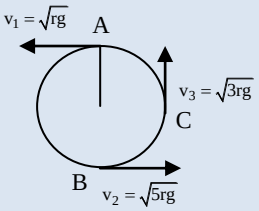
$eV_S = h\nu - h\nu_0$

If ν increases, stopping potential will increase.

34. A mass attached to one end of a string crosses top−most point on a vertical circle with critical speed. Its centripetal acceleration when string becomes horizontal will be (g = gravitational acceleration)

(A) g (B) 3g (C) 4g (D) 6g

34. (B)



Centripetal acceleration at C

$= \frac{v_3^2}{r} = \frac{3rg}{r} = 3g$

35. The expression for electric field intensity at a point outside uniformly charged thin plane sheet is (d is the distance of point from plane sheet)

(A) independent of d (B) directly proportional to $\sqrt{d}$

(C) directly proportional to d (D) directly proportional to $\frac{1}{\sqrt{d}}$

35. (A)

$E = \frac{\sigma}{2\varepsilon_0}$

$\therefore$ It is independent of 'd'.

36. When source of sound moves towards a stationary observer, the wavelength of sound received by him

(A) decreases while frequency increases (B) remains the same whereas frequency increases

(C) increases and frequency also increases (D) decreases while frequency remains the same

36. (A)

37. The deflection in galvanometer falls to $\left(\frac{1}{4}\right)^{th}$ when it is shunted by 3Ω. If additional shunt of 2Ω is connected to earlier shunt, the deflection in galvanometer falls to

(A) $\frac{1}{2}$ (B) $\left(\frac{1}{3}\right)^{rd}$ (C) $\left(\frac{1}{4}\right)^{th}$ (D) $\left(\frac{1}{8.5}\right)^{th}$

37. (D)

$\frac{I_G}{I} = \frac{S}{S+G}$

$\frac{1}{4} = \frac{3}{3+G}$

$\therefore \quad 3 + G = 12 \qquad \therefore \qquad G = 9\ \Omega$

If additional shunt of 2 Ω is connected then total shunt resistance becomes $S' = \frac{2\times3}{2+3} = \frac{6}{5}\Omega$

Again $\frac{I_G}{I} = \frac{S'}{S'+G} = \frac{\frac{6}{5}}{\frac{6}{5}+9} = \frac{6}{5}\times\frac{5}{51} = \frac{6}{51} = \frac{2}{17} = \frac{1}{8.5}$

38. A body is thrown from the surface of the earth with velocity 'u' m/s. The maximum height in m above the surface of the earth upto which it will reach is (R = radius of earth, g = acceleration due to gravity)

(A) $\frac{u^2R}{2gR-u^2}$ (B) $\frac{2u^2R}{gR-u^2}$ (C) $\frac{u^2R^2}{2gR^2-u^2}$ (D) $\frac{u^2R}{gR-u^2}$

38. (A)

$$\frac{1}{2}mu^2 = -\frac{GMm}{R+h} - \left(-\frac{GMm}{R}\right)$$

$$= \frac{GMm}{R} - \frac{GMm}{R+h}$$

$$= GMm\left[\frac{1}{R} - \frac{1}{R+h}\right]$$

$$\therefore \quad u^2 = 2GM\left[\frac{1}{R} - \frac{1}{R+h}\right]$$

$$u^2 = 2gR^2\left[\frac{R+h-R}{R(R+h)}\right]$$

$$u^2 = 2gR\left[\frac{h}{R+h}\right]$$

$$\therefore \quad \frac{u^2}{2gR} = \left[\frac{h}{R+h}\right] \qquad \therefore \quad \frac{R+h}{R} = \frac{2gR}{u^2}$$

$$\frac{R}{h} + 1 = \frac{2gR}{u^2}$$

$$\therefore \quad \frac{R}{h} = \frac{2gR}{u^2} - 1 = \frac{2gR-u^2}{u^2} \qquad \therefore \quad h = \frac{Ru^2}{2gR-u^2}$$

39. A series combination of N_1 capacitors (each of capacity C_1) is charged to potential difference '3V'. Another parallel combination of N_2 capacitors (each of capacity C_2) is charged to potential difference 'V'. The total energy stored in both the combinations is same. The value of C_1 in terms of C_2 is

(A) $\frac{C_2N_1N_2}{9}$ (B) $\frac{C_2N_1^2N_2^2}{9}$ (C) $\frac{C_2N_1}{9N_2}$ (D) $\frac{C_2N_2}{9N_1}$

39. (A)

$U = \frac{1}{2}CV^2$

$C_{eq_5} = \frac{C_1}{N_1} \rightarrow 3V$ (connected in series)

$C_{eq_{11}} = N_2C_2 \rightarrow V$ (connected in parallel)

$U = \frac{1}{2}\frac{C_1}{N_1}9v^2 = \frac{1}{2}N_2C_2v^2$

$C_1 = \frac{N_2C_2N_1}{9}$

40. Heat energy is incident on the surface at the rate of 1000 J/min. If coefficient of absorption is 0.8 and coefficient of reflection is 0.1 then heat energy transmitted by the surface in 5 mintes is
(A) 100 J (B) 500 J (C) 700 J (D) 900 J

40. (A)
$r + a + t = 1$
$t = 1 - r - a = 1 - 0.8 - 0.1 = 1 - 0.9 = 0.1$
$Q = 1000$ J/min
$\therefore$ heat energy transmitted per minute $Q.t = 1000 \times 0.1$ J $= 100$ J

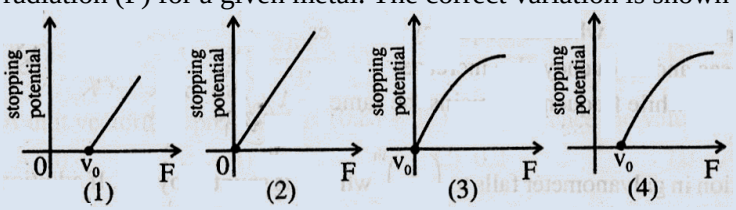
41. Two metal wires 'P' and 'Q' of same length and material are stretched by same load. Their masses are in the ratio $m_1 : m_2$. The ratio of elongations of wire 'P' to that of 'Q' is
(A) $m_1^2 : m_2^2$ (B) $m_2^2 : m_1^2$ (C) $m_2 : m_1$ (D) $m_1 : m_2$

41. (C)
$L_P = L_Q \quad F_P = F_Q$
$m_P : m_Q = m_1 : m_2$
$L_P A_P : L_Q A_Q = m_1 : m_2$
$A_P : A_Q = m_1 : m_2$
$Y = \dfrac{FL}{A\Delta\ell}$
$\therefore \Delta\ell = \dfrac{FL}{AY}$
$\Delta\ell \alpha \dfrac{L}{A}$
$\Delta\ell \alpha \dfrac{1}{A}$
$\therefore \dfrac{\Delta\ell_P}{\Delta\ell_Q} = \dfrac{A_Q}{A_P} = \dfrac{m_2}{m_1}$

42. Let $x = \left[\dfrac{a^2b^2}{c}\right]$ be the physical quantity. If the percentage error in the measurement of physical quantities a, b and c is 2, 3 and 4 percent respectively then percentage error in the measurement of x is
(A) 7% (B) 14% (C) 21% (D) 28%

42. (B)
$x = \dfrac{a^2b^2}{c}$
$\dfrac{\Delta x}{x}\% = \dfrac{2\Delta a}{a}\% + \dfrac{2\Delta b}{b}\% + \dfrac{\Delta c}{c}$
$= 2 \times 2 + 2 \times 3 + 4$
$= 4 + 6 + 4 = 14\%$

43. Following graphs show the variation of stopping potential corresponding to the frequency of incident radiation (F) for a given metal. The correct variation is shown in graph (V_0 = Threshold frequency)



(A) (1) (B) (2) (C) (3) (D) (4)

43. (A)

44. In compound microscope, the focal length and aperture of the objective used is respectively
(A) large and large (B) large and small (C) short and large (D) short and small

44. (D)

45. The energy of an electron having de-Broglie wavelength 'λ' is (h = Planck's constant, m = mass of electron)
(A) $\frac{h}{2m\lambda}$ (B) $\frac{h^2}{2m\lambda^2}$ (C) $\frac{h^2}{2m^2\lambda^2}$ (D) $\frac{h^2}{2m^2\lambda}$

45. (B)

$E = \frac{1}{2}mv^2 = \frac{1}{2m}\left(P^2\right) = \frac{1}{2m}\cdot\frac{h^2}{\lambda^2} = \frac{h^2}{2m\lambda^2}$ $\because P = \frac{h}{\lambda}$

46. 'n' number of waves are produced on a string in 0.5 second. Now the tension in the string is doubled (Assume length and radius constant), the number of waves produced in 0.5 second for the same harmonic will be
(A) n (B) $\sqrt{2}$ n (C) $\frac{n}{\sqrt{2}}$ (D) $\frac{n}{\sqrt{5}}$

46. (B)

$\frac{N_2}{N_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{2}$

$N_2 = \sqrt{2}N_1$

47. The increase in energy of a metal bar of length 'L' and cross-sectional area 'A' when compressed with a load 'M' along its length is (Y = Young's modulus of the material of metal bar)
(A) $\frac{FL}{2AY}$ (B) $\frac{F^2L}{2AY}$ (C) $\frac{FL}{AY}$ (D) $\frac{F^2L^2}{2AY}$

47. (B)

Vol. = LA

Stress = $\frac{F}{A}$ $Y = \frac{FL}{A\ell}$ $\therefore \ell = \frac{FL}{AY}$

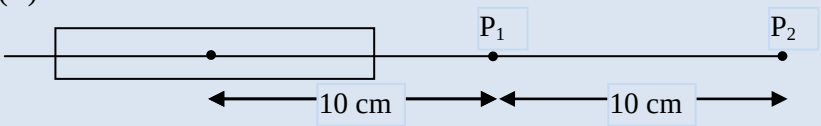
Strain = $\frac{\ell}{L}$

$\therefore U = \frac{1}{2}\frac{F}{A}\times\frac{\ell}{L}\times LA = \frac{1}{2}F.\ell$

$U = \frac{1}{2}F\frac{FL}{AY} = \frac{1}{2}\frac{F^2L}{AY}$

48. The ratio of magnetic fields due to a bar magnet at the two axial points P_1 and P_2 which are separated from each other by 10 cm is 25 : 2. Point P_1 is situated at 10 cm from the centre of the magnet. Magnetic length of the bar magnet is (Points P_1 and P_2 are on the same side of magnet and distance of P_2 from the centre is greater than distance of P_1 from the centre of magnet)
(A) 5 cm (B) 10 cm (C) 15 cm (D) 20 cm

48. (B)



$\frac{B_1}{B_2} = \frac{25}{2}$; $B_{axis} = \frac{\mu_0}{4\pi}\cdot\frac{2Mr}{(r^2-\ell^2)^2}$

$$B_1 = \frac{\mu_0}{4\pi} \cdot \frac{2M \times 0.1}{\left[(0.1)^2 - \ell^2\right]^2}$$

$$B_2 = \frac{\mu_0}{4\pi} \cdot \frac{2M \times 0.2}{\left[(0.2)^2 - \ell^2\right]^2}$$

$$\frac{B_1}{B_2} = \frac{0.1}{\left[(0.1)^2 - \ell^2\right]^2} \times \frac{\left[(0.2)^2 - \ell^2\right]^2}{0.2}$$

$$\therefore \quad \frac{25}{2} = \frac{\left[(0.2)^2 - \ell^2\right]^2}{2\left[(0.1)^2 - \ell^2\right]^2} \quad \therefore \quad 25 = \frac{\left[0.04 - \ell^2\right]^2}{\left[0.01 - \ell^2\right]^2}$$

$$\therefore \quad 5 = \frac{0.04 - \ell^2}{0.01 - \ell^2}$$

$0.05 - 5\ell^2 = 0.04 - \ell^2$

$0.01 = 4\ell^2$

$0.1 = 2\ell$

$\ell = 0.05\,\text{m} = 5\,\text{cm}$

Magnetic length = 2ℓ = 10 cm

49. A satellite is revolving in a circular orbit at a height 'h' above the surface of the earth of radius 'R'. The speed of the satellite in its orbit is one-fourth the escape velocity from the surface of the earth. The relation between 'h' and 'R' is

(A) h = 2R (B) h = 3R (C) h = 5R (D) h = 7R

49. (D)

$$v_0 = \sqrt{\frac{GM}{R+h}}$$

$$v_e = \sqrt{\frac{2GM}{R}}$$

$4v_0 = v_e$

$$4\sqrt{\frac{GM}{R+h}} = \sqrt{\frac{2GM}{R}}$$

$$\frac{GM}{R+h} = \frac{2GM}{R}$$

$8R = R + h$

$7R = h$

50. A pipe closed at one end has length 83 cm. The number of possible natural oscillations of air column whose frequencies lie below 1000 Hz are (velocity of sound in air = 332 m/s)

(A) 3 (B) 4 (C) 5 (D) 6

50. (C)

$\ell = 83 \times 10^{-2}$ cm

v = 332 m/s

$$n_0 = \frac{v}{4L} = \frac{332}{4 \times 83 \times 10^{-2}} = 100$$

$n_0 : n_1 : n_2 : n_3 : n_4 = 1:3:5:7:9 = 100:300:500:700:900$

$\therefore$ Number of possible natural frequency = 5.

CHEMISTRY

51. A certain reaction occurs in two steps as

i) $2SO_{2(g)} + 2NO_{2(g)} \rightarrow 2SO_{3(g)} + 2NO_{(g)}$

ii) $2NO_{(g)} + O_2(g) \rightarrow 2NO_{2(g)}$

In the reaction,

(A) $NO_{2(g)}$ is intermediate (B) $NO_{(g)}$ is intermediate

(C) $NO_{(g)}$ is catalyst (D) $O_{2(g)}$ is intermediate

51. (B)

As, **NO** is formed during reaction and again consumed it is intermediate.

52. Which among the following equations represents the first law of thermodynamics under isobaric conditions ?

(A) $\Delta U = q_p - P_{ex} \cdot \Delta V$ (B) $q_v = \Delta U$ (C) $\Delta U = W$ (D) $W = -q$

52. (A)

First law of thermodynamics is

$\Delta U = q + p \cdot \Delta v$

when p is constant i.e. isobaric process

$q = q_p$

$\therefore \quad \Delta U = q_p - P_{ex} \cdot \Delta V$

53. During galvanization of iron, which metal is used for coating iron surface ?

(A) Copper (B) Zinc (C) Nickel (D) Tin

53. (B)

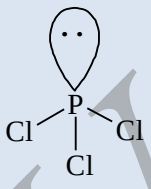
Zn : Galvanization is coating of Zn on Fe metal.

54. Formation of PCl_3 is explained on the basis of what hybridisation of phosphorus atom?

(A) SP^2 (B) SP^3 (C) SP^3d (D) SP^3d^2

54. (B)

Hybridization of P in PCl_3 is sp^3.



55. Identify the element that forms amphoteric oxide.

(A) Carbon (B) Zinc (C) Calcium (D) Sulphur

55. (B)

C and S forms acidic oxide.

Ca forms basic oxide.

Zn forms amphoteric oxide.

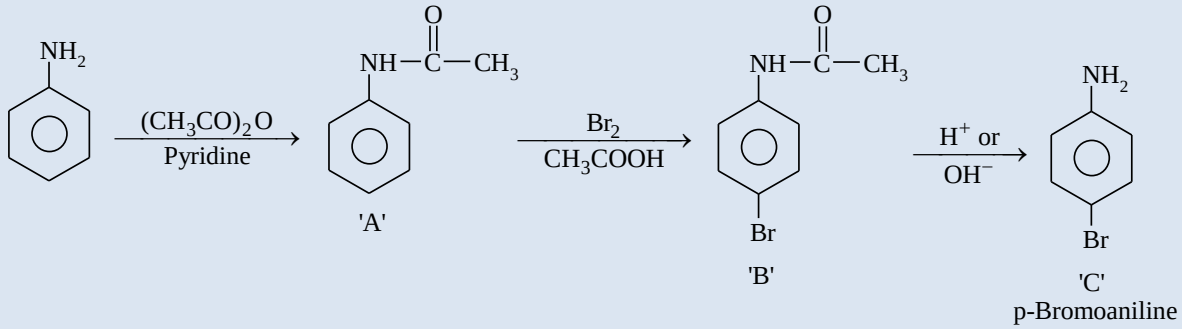
56. Identify the product 'C' in the following reaction.

$$\text{Aniline} \xrightarrow[\text{Pyridine}]{(CH_3CO)_2O} A \xrightarrow[CH_3COOH]{Br_2} B \xrightarrow{H^+ \text{or } OH^-} C$$

(A) Acetanilide (B) p–Bromoacetanilide

(C) p – Bromoaniline (D) o – Bromoaniline

56. (C)



57. Identify the functional group that has electron donating inductive effect.
(A) – COOH (B) – CN (C) – CH_3 (D) – NO_2

57. (C)
$-CH_3$: Methyl group is e^- donating i.e +I effect

58. Which among the following metals crystallise as a simple cube?
(A) Polonium (B) Iron (C) Copper (D) Gold

58. (A)
Po

59. Which among the following oxoacids of phosphorus shows a tendency of disproportionation?
(A) Phosphinic acid (H_3PO_2) (B) Orthophosphoric acid (H_3PO_4)
(C) Phosphonic acid (H_3PO_3) (D) Pyrophosphoric acid ($H_4P_2O_7$)

59. (C)

$4H_3PO_3 \longrightarrow 3H_3PO_4 + PH_3 \longrightarrow$ Disproportionation reaction

+3 +5 –3

Oxidation Number

H_3PO_2	+1
H_3PO_4	+5
H_3PO_3	+3
$H_4P_2O_7$	+5

60. What is the oxidation number of gold in the complex $[AuCl_4]^{1-}$?
(A) + 4 (B) + 3 (C) + 2 (D) + 1

60. (B)
$[AuCl_4]^{1-}$
$x + 4(-1) = -1 \quad \therefore \quad x = +3$

61. Which symbol replaces the unit of atomic mass, amu?
(A) u (B) A (C) M (D) n

61. (A)
u → unified mass represents the unit of atomic mass.

62. Which of the following compounds reacts immediately with Lucas reagent?
(A) CH_3CH_2OH (B) $CH_3CH_2CH_2OH$

(C) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$ (D) $CH_3-\underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$

62. (D)
Reactivity of alcohols towards Lucas reagent is
3° > 2° > 1°

63. What is the catalyst used for oxidation of SO_2 to SO_3 in lead chamber process for manufacture of sulphuric acid?
(A) Nitric oxide (B) Nitrous oxide (C) Potassium iodide (D) Dilute HCl

63. (A)
NO is used as catalyst in lead chamber process for manufacture of H_2SO_4

$$SO_2 \xrightarrow[\substack{H_2O \\ (steam)}]{NO} SO_3$$

64. The number of moles of electrons passed when current of 2 A is passed through an solution of electrolyte for 20 minutes is
(A) 4.1×10^{-4} mol e^- (B) 1.24×10^{-2} mol e^-
(C) 2.487×10^{-2} mol e^- (D) 2.487×10^{-1} mol e^-

64. (C)

$$\text{No. of moles of } e^- = \frac{Q}{F}$$

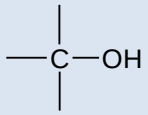
$$\therefore \quad n_{e^-} = \frac{2 \times 20 \times 60}{96500} = 2.487 \times 10^{-2} \text{ mol } e^-.$$

65. The molarity of urea (molar mass 60 g mol^{-1}) solution by dissolving 15 g of urea in 500 cm^3 of water is
(A) 2 mol dm^{-3} (B) 0.5 mol dm^{-3} (C) 0.125 mol dm^{-3} (D) 0.0005 mol dm^{-3}

65. (B)

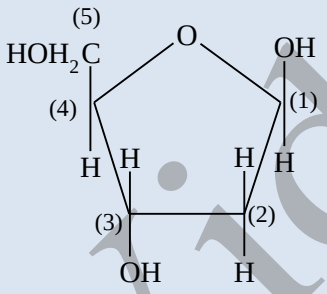
$$M = \frac{W_2}{M_2} \times \frac{1000}{\text{Vol. mL}}$$

$$M = \frac{15}{60} \times \frac{1000}{500} = \frac{1}{2} = 0.5 \text{ mol dm}^{-3}$$

66. Which carbon atom of deoxy Ribose sugar in DNA does NOT contain  bond ?

(A) C_5 (B) C_3 (C) C_2 (D) C_1

66. (C)



67. Which of the following carboxylic acids is most reactive towards esterification?
(A) $(CH_3)_3$ CCOOH (B) $(CH_3)_2CHCOOH$ (C) CH_3CH_2COOH (D) $(C_2H_5)_2CHCOOH$

67. (C)
Order of reactivity.
$CH_3CH_2COOH > (CH_3)_2CHCOOH > (C_2H_5)_2CHCOOH > (CH_3)_3C–COOH$

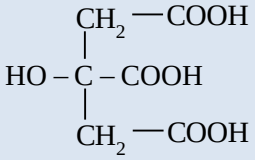
68. Molarity is
(A) The number of moles of solute present in 1 dm^3 volume of solution
(B) The number of moles of solute dissolved in 1 kg of solvent
(C) The number of moles of solute dissolved in 1 kg of solution
(D) The number of moles of solute dissolved in 100 dm^3 volume of solution

68. (A)

$$\text{Molarity} = \frac{\text{Moles}}{\text{Vol. of solution in 'dm}^3\text{'}}$$

69. Which of the following is a tricarboxylic acid?
(A) Citric acid (B) Malonic acid (C) Succinic acid (D) Malic acid

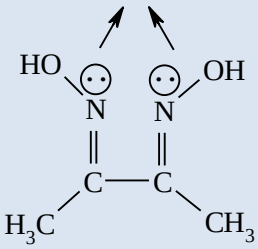
69. (A)



Citric acid

70. What is the number of donar atoms in dimethylglyoximato ligand?
(A) 1 (B) 2 (C) 3 (D) 4

70. (B)



Bidentate Ligand

71. In which substance does nitrogen exhibit the lowest oxidation state?
(A) nitrogen gas (B) ammonia (C) nitrous oxide (D) nitric oxide

71. (B)
NH_3 : Oxidation no. of N is –3.

72. Which of the followings is most reactive towards addition reaction of hydrogen cyanide to form corresponding cyanohydrin?
(A) Acetone (B) Formaldehyde (C) Acetaldehyde (D) Diethylketone

72. (B)
Formaldehyde
Reactivity towards nucleophilic addition : Aldehyde > Ketone.
In aldehydes $HCHO > CH_3CHO > CH_3CH_2CHO$.

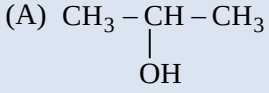
73. The most basic hydroxide from following is
(A) Pr $(OH)_3$ (Z = 59) (B) Sm $(OH)_3$ (Z = 62) (C) Ho $(OH)_3$ (Z = 67) (D) La$(OH)_3$ (Z = 57)

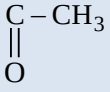
73. (D)
La$(OH)_3$: Basic strength decreases from La$(OH)_3$ to Lu$(OH)_3$.

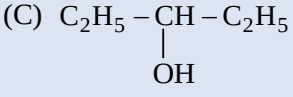
74. What is the SI unit of density?
(A) g cm^{-3} (B) g m^{-3} (C) kg m^{-3} (D) kg cm^{-3}

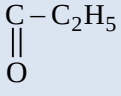
74. (C)
Kg m^{-3} is SI unit of density.

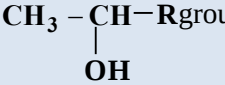
75. Which of the following compounds does NOT undergo haloform reaction?

(A) 

(B) 

(C) 

(D) 

75. (C)
Only methyl ketones, acetaldehyde and 2° alcohol with  group gives iodoform reaction.

76. Two moles of an ideal gas are allowed to expand from a volume of 10 dm^3 to $2m^3$ at 300 K against a pressure of 101.325 KPa. Calculate the work done.
(A) –201.6 kJ (B) 13.22 kJ (C) –810.6 J (D) –18.96 kJ

76. (A)
$W = -P(\Delta V)$
$= -101325 \times (2 - 0.01)$
$= (-101325) \times (+1.99)$ J
$= -201.636$ kJ.
$P = 101.325$ k Pa
$P = 101325$ Pa
$V_1 = 10\ dm^3 = 10 \times 10^{-3}\ m^3 = 10^{-2}\ m^3$
$V_2 = 2m^3$

77. In which among the following solids, Schottky defect is NOT observed?
(A) ZnS (B) NaCl (C) KCl (D) CsCl

77. (A)
NaCl, KCl, CsCl show Schottky defect.

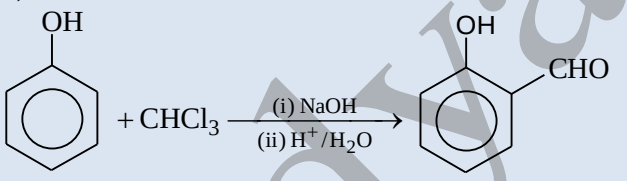
78. What are the products of auto–photolysis of water?
(A) H_2 and O_2 (B) Steam (C) H_3O^+ and OH^- (D) Hydrogen peroxide

78. (A)
$2H_2O \xrightarrow{hv} 2H_2 + O_2$

79. Bauxite, the ore of aluminium, is purified by which process?
(A) Hoope's process (B) Hall's process (C) Mond's process (D) Liquation process

79. (B)
Hall's process.

80. Phenol in presence of sodium hydroxide reacts with chloroform to form salicylaldehyde. The reaction is known as
(A) Kolbe's reaction (B) Reimer–Tiemann reaction
(C) Stephen reaction (D) Etard reaction

80. (B)


Reimer -Tiemann reaction

81. Which among the following elements of group–2 exhibits anomalous properties?
(A) Be (B) Mg (C) Ca (D) Ba

81. (A)
'Be' (Beryllium) being smallest and most electro–ve it exhibits anomalous properties.

82. Excess of ammonia with sodium hypochloride solution in the presence of glue or gelatin gives
(A) $NaNH_2$ (B) NH_2NH_2 (C) N_2 (D) NH_4Cl

82. (B)
$2NH_3 + NaOH \rightarrow NaCl + H_2O + \underset{\text{Hydrazine}}{NH_2.NH_2}$

83. What is the density of solution of sulphuric acid used as an electrolyte in lead accumulator?
(A) 1.5 gmL^{-1} (B) 1.2 gmL^{-1} (C) 1.8 gmL^{-1} (D) 2.0 gmL^{-1}

83. (B)
H_2SO_4 solution used as electrolyte has demisty 1.2 gm L^{-1}

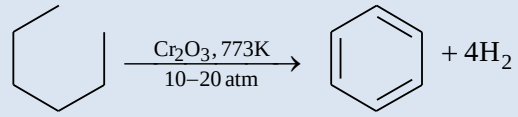
84. Which of the following polymers is used to manufacture clothes for firefighters?
(A) Thiokol (B) Kevlar (C) Nomex (D) Dynel

84. (C)
Nomex–Protective clothes for firefighters are prepared.

85. Which element is obtained in the pure form by van Arkel method?
(A) Aluminium (B) Titanium (C) Silicon (D) Nickel
85. (B)
Van-Arkel method is used for Zr and Ti.

86. Which of the following is **NOT** a tranquilizer?
(A) Meprobamate (B) Equanil (C) Chlorodiazepoxide (D) Bromopheniramine
86. (D)
Bromopheniramine is not tranquilizes.

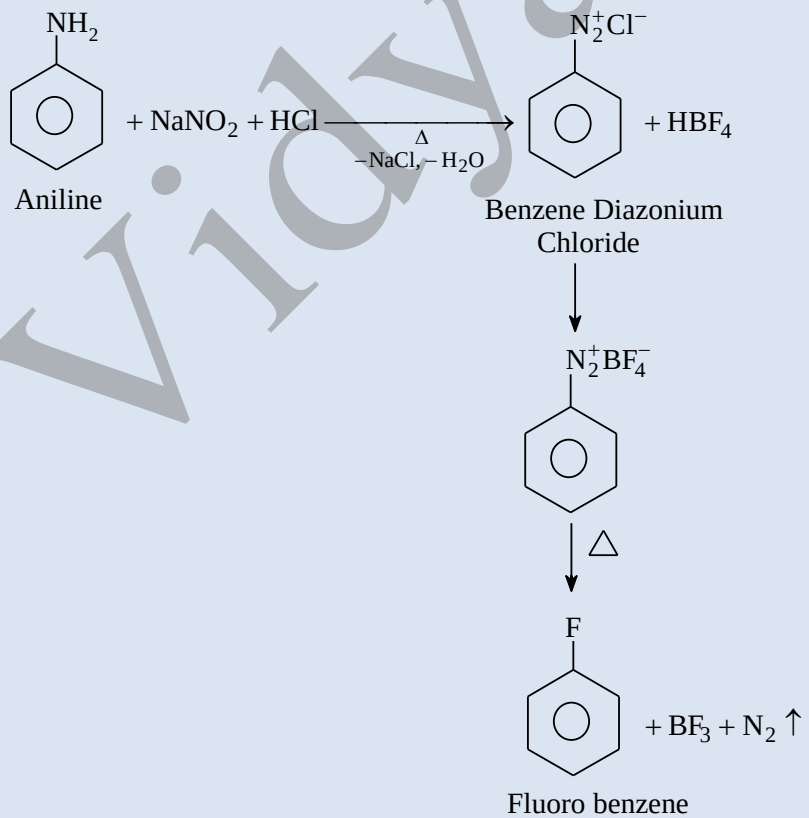
87. Conversion of hexane into benzene involves the reaction of
(A) hydration (B) hydrolysis (C) hydrogenation (D) dehydrogenation
87. (D)



n-Hexane Dehydrogenation Benzene

88. The element that does **NOT** exhibit allotropy is
(A) phosphorus (B) arsenic (C) antimony (D) bismuth
88. (D)
Expect Bi all exhibit allotropy.

89. Which of the following reactions is used to prepare aryl fluorides from diazonium salts and fluoroboric acid?
(A) Sandmeyer reaction (B) Balz–Schiemann reaction
(C) Gattermann reaction (D) Swarts reaction
89. (B)



90. The correct relation between elevation of boiling point and molar mass of solute is

(A) $M_2 = \frac{K_b.W_2}{\Delta T_b.W_1}$ (B) $M_2 = \frac{K_b.W_1}{\Delta T_b.W_2}$ (C) $M_2 = \frac{\Delta T_b.K_b}{W_1.W_2}$ (D) $M_2 = \frac{\Delta T_b.W_1}{K_b.W_2}$

90. (A)

$\Delta T_b = K_b \times m$ (m is molality)

$= K_b \times \frac{n_2}{\text{Wt. of solvent in kg}}$

$= K_b \times \frac{W_2}{M_2 \times W_1}$

Where $n_2 \rightarrow$ No. of mole of solute

$W_2 \rightarrow$ Wt. of solute in solution

$M_2 \rightarrow$ Molar Mass of Solute

$M_2 = \frac{K_b \times W_2}{\Delta T_b \times W_1}$

91. Which among the group−15 elements does **NOT** exists as tetra atomic molecule?

(A) Nitrogen (B) Phosphorus (C) Arsenic (D) Antimony

91. (A)

Nitrogen does not have empty d orbital like other element of 15th group.

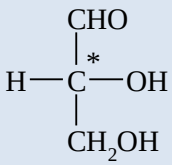
Hence it shows only tetravalency.

$_7N \rightarrow 1s^2\ 2s^2\ 2p^3$.

92. Identify the monosaccharide containing only one asymmetric carbon atom in its molecule.

(A) Ribulose (B) Ribose (C) Erythrose (D) Glyceraldehyde

92. (D)



Glyceraldehyde

93. Identify the oxidation states of titanium (Z = 22) and copper (Z = 29) in their colourless compounds.

(A) Ti^{3+}, Cu^{2+} (B) Ti^{2+}, Cu^{2+} (C) Ti^{4+}, Cu^{1+} (D) Ti^{4+}, Cu^{2+}

93. (C)

$_{22}Ti \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$

$Ti^{4+} \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s° 3d°$ (No unpaired electron in d orbital)

$_{29}Cu \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$

$Cu^{1+} \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s° 3d^{10}$ (No unpaired electron in d orbital)

If no. unpaired electron is present in d orbital of the transition metal or ion then its solution becomes colour less.

94. Arenes on treatment with chlorine in presence of ferric chloride as a catalyst undergo what type of reaction ?

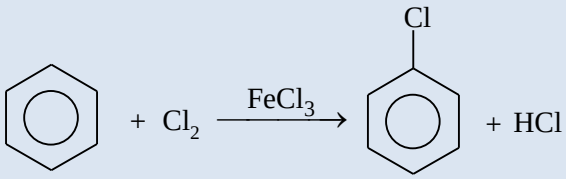
(A) Electrophilic substitution (B) Nucleophilic substitution

(C) Electrophilic addition (D) Nucleophilic addition

94. (A)

Arenes shows more reactivity for electrophilic substitution reaction.

Electrophile



Benzene Chlorobenzene

In reaction $Fecl_3$ is lewis acid used to form electrophile

95. In case of R, S configuration the group having highest priority is

(A) $-NO_2$ (B) $-NH_2$ (C) $-CN$ (D) $-OH$

95. (D)

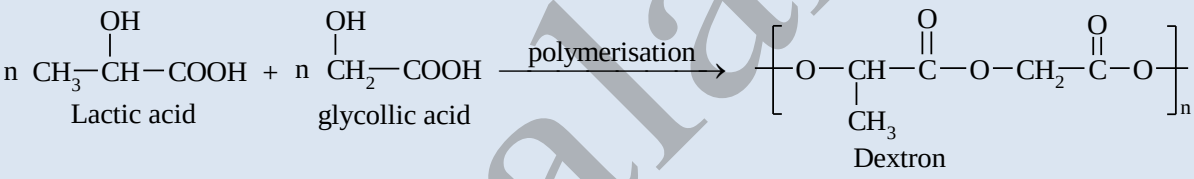
in –OH, oxygen is bonded to chiral carbon atom which has highest atomic number among others.

96. Lactic acid and glycollic acid are the monomers used for preparation of polymer

(A) Nylon–2–nylon–6 (B) Dextron

(C) PHBV (D) Buna–N

96. (B)



Lactic acid glycollic acid Dextron

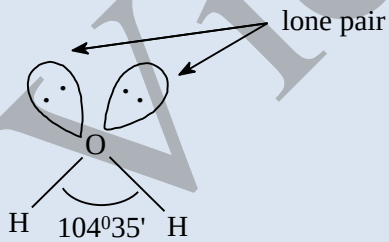
97. What is the geometry of water molecule?

(A) distorted tetrahedral (B) tetrahedral

(C) trigonal planer (D) diagonal

97. (A)

In H_2O, oxygen undergoes sp^3 hybridisation. It should be tetrahedral but in structure oxygen atom carries two lone pair which make structure distorted



98. With which halogen the reactions of alkanes are explosive?

(A) Fluorine (B) Chlorine (C) Bromine (D) Iodine

98. (A)

Reaction of alkane with fluorine is exothermic process

99. Calculate the work done during combustion of 0.138 kg of ethanol, $C_2H_5OH_{(l)}$ at 300 K.

Given : R = 8.314 Jk^{-1} mol^{-1}, molar mass of ethanol = 46 g mol^{-1}.

(A) –7482 J (B) 7482 J (C) –2494 J (D) 2494 J

99. (A)

$$C_2H_5OH_{(\ell)} + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(\ell)}$$

$\Delta n = 2 - 3 = -1$

$w = -\Delta n\, RT$

$\therefore \quad w = + (1) \times 8.314 \times 300$

$\therefore \quad w = 2494.2$ J

For 46 gm ethanol work done $\Rightarrow$ 2494.2 J

$\therefore$ 138 gm ethanol work done $\Rightarrow$ x J

$$x = \frac{138 \times 2494.2}{46} = 7482.6 \text{ J}$$

100. Slope of the straight line obtained by plotting $\log_{10}k$ against 1/T represents what term?

(A) $-E_a$ (B) $-2.303\ E_a/R$ (C) $-E_a/2.303\ R$ (D) $-E_a/R$

100. (C)

$$\text{In } k = \text{In } A - \frac{Ea}{RT}$$

$$\log_{10} k = \log_{10} A - \frac{Ea}{2.303RT}$$

$$\log_{10} k = \frac{-Ea}{2.303R} \times \frac{1}{T} + \log_{10} A$$

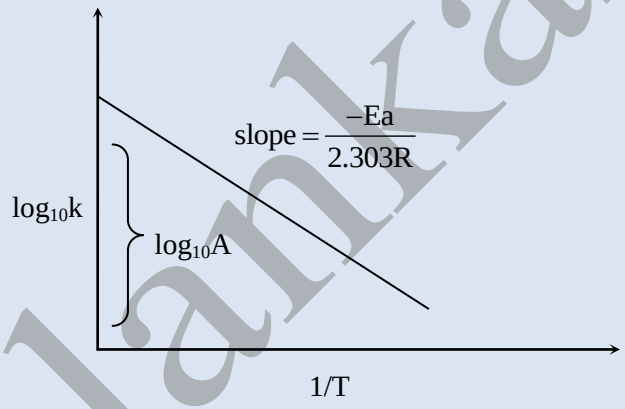
$y = mx + C$

$y = \log_{10}k$

$x = \frac{1}{T}$

$C = \log_{10}A$

$$m = \text{slope} = \frac{-Ea}{2.303R}$$



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