

JEE Mains 2024 Shift 1 Question Paper (1 February)

Physics

Q. A vernier caliper has 10 main scale divisions coinciding with 11 vernier scale divisions equals 5 mm. What is the least count of the device?

Q. Determine Min. Energy released when an electron jumps to ground state in Balmer series from infinity.

Q. On increasing temperature, the elasticity of a material will:

- Increase
- Decrease
- Remain constant
- May increase or decrease

Q. Two particles, each of mass 2 kg are placed in the x - y plane such that m_x is 4 m on the negative x-axis and m_y is 4 m on the positive y-axis. If the distance of the center of mass from the origin is $[(4\sqrt{2})/x]$, find x.

Q. What are the dimensions of an angular impulse?

Q. With rise in temperature the young's modulus of elasticity

- Increases
- Decreases
- Remaining constant
- None of these

Q. If a bullet of mass 10^{-2} kg and velocity 200 m/s gets embedded inside the bob of mass 1 kg of a simple pendulum, then what will be the maximum height that the system rises by in cm?

Q. A vernier caliper has 10 main scale divisions coinciding with 11 vernier scale division equals 5 mm. the least count of the device is :

- $\frac{1}{2}$
- $\frac{5}{12}$
- $\frac{5}{11}$
- 0.3

Q. The length of a seconds pendulum, if it is placed at height $2R$ (where R = the radius of the earth) from the surface of the earth, is $[\frac{10}{x\pi^2}]$ m. Find x.

Q. In case of isoelectronic species the size of F, No and Nat is affected by:

- (a) Principle Quantum number (n)
- (b) Electron - electron interaction
- (c) Nuclear change (z)
- (d) None of the factors because their size is the same

Q. Determine the lowest energy of a photon emitted in the Balmer Series of a hydrogen atom.

Q. Find percentage change in capacitance if potential difference across it has been changed from V to 2V.

Chemistry

Q. If mass defect in a nuclear reaction is 0.4gm then find the Q-value of the reaction.

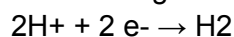
Q. The total number of deactivating groups among the following is:

-CN, -NH-CO-CH₃, -CO-CH₃, -NH-CH₃

Q. What is the pH of CH₃COONH₄? (At 25°C)

Given: K_a of CH₃COOH = 1.8 × 10⁻⁵, K_b of NH₄OH = 1.8 × 10⁻⁵

Q. We are given with following cell reaction:



P_{H₂} = 2 atm

[H⁺] = 1M

(2.303RT / F = 0.06)

If E_{cell} of the reaction is given by -x × 10⁻³ V. Find out x.

Q. Statement I: PH₃ will have a lower boiling point than NH₃.

Statement II: There are strong van der Waals forces in NH₃ and strong hydrogen bonding in PH₃.

- i. Both statements I and II are correct.
- ii. Both statements I and II are incorrect.
- iii. Statement I is correct and statement II is incorrect.
- iv. Statement I is incorrect and statement II is correct.

Q. Find out the total possible optical isomers of 2-chlorobutane.

Q. In the case of isoelectronic species the size of F⁻, Na and Na⁺ is affected by:

- A. Principle of Quantum number(n)
- B. Electron - electron interaction
- C. Nuclear change (z)
- D. None of the factors because their size is the same

Q. Which of the following is the correct for adiabatic free expansion against vacuum?

- i. q = 0, ΔU = 0, w = 0

- ii. $q \neq 0, w = 0, \Delta U = 0$
- iii. $q = 0, \Delta U \neq 0, w = 0$
- iv. $q = 0, \Delta U \neq 0, w \neq 0$

Q. In Kjeldahl's method for estimation of nitrogen, CuSO_4 acts as

- A. Oxidizing agent
- B. Reducing agent
- C. Catalytic agent
- D. Hydrolysis agent

Q. Complementary stand of DNA ATGCTTCA is:

- i. TACGAAGA
- ii. TACGAAGT
- iii. TAGCAACA
- iv. TAGCTACT

Mathematics

Q. 3, a, b, c are in AP 3, a-1, b+1, c+9 \rightarrow GP Then AM of a, b, c is

Q. 3, 7, 1,, 404 and 4, 7, 10,, 403 sum of common terms

Q. The value of the integral

$$\int_0^{\pi/4} \frac{x dx}{\cos^4 2x + \sin^4 2x} =$$

Q. Number of ways of

arranging 5 officers in 4 rooms.

Q.

$$L_1: \vec{r} = (i + 2j + 3k) + \lambda(i - j + k); L_2: \vec{r} = (4i + 5j + 6k) - \mu(i + j - k)$$

intersect L_1 and L_2 at P and Q respectively. If (α, β, γ) is the mid point of the line segment PQ, then $2(\alpha, \beta, \gamma)$ is equal to