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:
i. Increase
ii. Decrease
iii. Remain constant
iv. May increase or decrease

Q.Two particles, each of mass 2 kg are placed in the x - y plane such that mx is 4 m on the negative x-axis and my 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
A. Increases
B. Decreases
C. Remaining constant
D. 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 :
A. ½
B. 5/12
C. 5/11
D. 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 [$10/x\pi 2$] m. Find x.

Q. In case of isoelectronic species the size of F, No and Nat is attected 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: Ka of CH3COOH = 1.8 x 10-5 , Kb of NH4OH = 1.8 x 10-5

Q. We are given with following cell reaction:
$2H^+ + 2e^- \rightarrow H_2$
P_{H_2}= 2 atm
$[H^+]$= 1M
(2.303RT / F = 0.06)
If Ecell 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. $q = 0, \Delta U = 0, w = 0$

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 → 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.

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

intersect L1 and L2 at P and Q respectively. If (α, β, γ) is the mid point of the line segment PQ, then 2(α, β, γ) is equal to