NEW STANDARD ACADEMY

Exam : MOCK- 11 | NEET - JEE | Marks: 60

Date : 29-05-23 | CLASS : 12^{TH} | Time: 3 HRS

PHYSICS

1. A long charged cylinder of linear chargeddensity λ is surrounded by a hollow co-axialconducting cylinder. What is the electricfield in the space between the two cylinders?
2. Two charged conducting spheres of radii a and b are connected to each other by a wire. What is the ratio of electric fields at the surfaces of the two spheres? Use the result obtained to explain why charge density on the sharp and pointed ends of a conductor is higher than that of its flatter portions.
3. An electrical technician requires a capacitance of 2 μF in a circuit across a potential difference ofl kV. A large number ofl μF capacitors are available to him each of which can withstand a potential difference of not more than 400 V. Suggest a possible arrangement that requires the minimum number of capacitors.
4. Describe schematically the equipotential surfaces corresponding to

   (a) a constant electric field in the Z- direction,
   (b) a field that uniformly increases in magnitude but remains in a constant (say, Z) direction,
   (c) a single positive charge at the origin, and
   (d) a uniform grid consisting of long equally spaced parallel charged wires in a plane.
5. A slab ofmaterial of dielectric constant K has the same area as that of the plates of a parallel plate capacitor but has the thickness $d/3$, where d is the separation between the plates. Find out the expression for its capacitance when the slab is inserted between the plates of the capacitor.
6. Show on a graph, the variation of resistivity with temperature for a typical semiconductor.
7. Describe how the resistivity of a conductor depend upon
   (i) Number density (n) of free electrons and
   (ii) relaxation time (τ).
8. (i) Derive the relation between current density j and potential difference V across a current carrying conductor of length l, area of cross section A and the number density n of free electrons.
   (ii) Estimate the average drift speed of conduction electrons in a copper wire of cross sectional area 1.0×10^{-7} m^2 carrying a current of 1.5 A. [Assume that the number density of conduction electrons is 9×10^{28} m^{-3}].
9. (i) Six lead acid type of secondary cells each of emf 2.0 V and internal resistance 0.015 Ω are joined in series to provide a supply to a resistance of 8.5Ω. What are the current drawn from the supply and its terminal voltage?
   (ii) A secondary cell after long use has an emf of 1.9 V and a large internal resistance of 380 Ω. What maximum current can be drawn from the cell? Could the cell drive the starting motor of a car?
10. Prove that $\rho = \frac{m}{ne^2\tau}$ where the symbols have usual meaning.

CHEMISTRY

1. What is the order of the reaction which has rate constant, $k = 3\times10^{-4}\ L\,mol^{-1}s^{-1}$?
2. Why is the equilibrium constant K related to only E^0_{cell} and not E_{Cell}?
3. Given the standard electrode potentials,
   $K^+/K = -2.93$ V, $Ag^+/Ag = 0.80$ V
   $Hg^{2+}/Hg = 0.79$ V
   $Mg^{2+}/Mg = -2.37$ V,
   $Cr^{3+}/Cr = -0.74$ V
   Arrange these metals in their increasing order of reducing power.
4. The conductivity of a 0.20 KCl solution at 298 K is 0.0248 $S\ cm^{-1}$. Calculate its molar conductivity.
5. If a current of 0.5 A flows through a metallic wire for 2h, then how many electrons would flow through the wire?
6. Determine the values of equilibrium constant (K_c) and ΔG^o for the following reactions
   $Ni(s) + 2Ag^+(aq) \rightarrow Ni^2(aq) + 2Ag(s)$
   $E^o = 1.05\ V\,(1F = 96500\ C\,mol^{-1})$
7. Write the Nernst equation and the emf of the following cell at 298 K.

(i) $Mg(s) | Mg^{2+}(0.001M) \| Cu^{2+}(0.0001M)Cu(s)$

(ii) $Fe(s)Fe^{2+}(0.001M) \| H^{+}(1M)$

$| H_2(g)(1bar) | Pt(s)$

Given that $E^0 = Mg^{2+} / Mg = -2.36V$

$E^0Cu^{2+} / Cu = 0.34V : E^0Fe^{2+} / Fe = -0.44V$

8. If two substances A and B have mole fraction in solution as 1 : 2. Then, what will be the mole fraction of 1 in vapour phase?

9. Calculate the mass percentage of benzene (C_6H_6) and carbon tetrachloride (CCl_4), if 22 g of benzene is dissolved in 122 g of CCl_4.

10. Calculate the mole fraction of benzene in solution containing 30 % by mass of it in carbon tetrachloride.

BIOLOGY

1. How did Hershey and chase prove that DNA is genetic material?
2. What do you understand by leading stand and lagging strand during DNA replication.
3. What is transcription unit explain it?
4. If the sequence of coding stand in transcription unit is written as follow-
   5'ATGCATGCATAGC-3'
   Write down sequence of mRNA.
5. What is a regulation of gene expression explained with example?
6. The following question consists of two statement each Assertion (A) and Reason(R) .To answer these question,mark the correct alternative as directed below-
   A-If both A And B are true and R is the correct explanation of A
   B both A and R true but R is not the correct explanation of A
   C if A is a true but R is the false
   D.if both A and R are false.

Assertion- In honey bees female is a diploid and male is haploid

Reason- gametes are formed by meiosis in female and by mitosis in male

7. Each pollen grain produce 2 male gametes how many pollen grain will be required to fertilize 4 ovules present in particular carpel give reason in support of your answer?
8. Define with example-
   a-Monosomy
   b-Trisomy
9. What is ubisch bodies, give its function?
10. What is the ploidy level of nucleus, MMC, functional megaspore and female gametophyte?

MATHS

1. If $\theta = \sin^{-1}[\sin(-600°)]$, then one of the possible value of θ is

2. Value of $\cos^{-1}\left(\cos\frac{5\pi}{3}\right) + \sin^{-1}\left(\sin\frac{5\pi}{3}\right)$ is

3. If $\sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} - ...\right) + \cos^{-1}\left(x^2 - \frac{x^4}{2} + \frac{x^6}{4} - ...\right) = \frac{\pi}{2}$ for $0 < |x| < \sqrt{2}$, then x equals

4. The number of real solutions of $\tan^{-1}\sqrt{x(x+1)} + \sin^{-1}\sqrt{x^2 + x + 1} = \frac{\pi}{2}$ is

5. $\sin^{-1}\frac{12}{13} + \cos^{-1}\frac{4}{5} + \tan^{-1}\frac{63}{16} =$

6. If $\cos^{-1}\frac{x}{2} + \cos^{-1}\frac{y}{3} = \theta$, then $9x^2 - 12xy\cos\theta + 4y^2 =$

7. The equation $2\cos^{-1}x = \sin^{-1}\left(2x\sqrt{1 - x^2}\right)$ is valid for all values of x satisfying

8. If $1 < x < \sqrt{2}$, then number of solutions of the equation $\tan^{-1}(x - 1) + \tan^{-1} x + \tan^{-1}(x + 1) = \tan^{-1} 3x$, is/are

9. If $\alpha = \sin^{-1}\frac{4}{5} + \sin^{-1}\frac{1}{3}$ and $\beta = \cos^{-1}\frac{4}{5} + \cos^{-1}\frac{1}{3}$, then prove that $\alpha < \beta$

10. If α, β, γ are the roots of the equation $x^3 + mx^2 + 3x + m = 0$, then the general value of $\tan^{-1}\alpha + \tan^{-1}\beta + \tan^{-1}\gamma$ is-