NEW STANDARD ACADEMY

Semri Kothi Super Market, Raebareli
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PHYSICS

1. Define magnetic field. Also derive an expression for the force acting on a moving charge in magnetic field .When this force is maximum and minimum.
2. A proton moves with a velocity $\vec{v} = (2\hat{\imath} + 2\hat{\jmath} - \hat{k})$ m/s through a region where both electric and magnetic fields exits. The electric field, $\vec{E} = (\hat{\imath} - \hat{\jmath} - 3\hat{k})$N/C and magnetic field, $\vec{B} = (\hat{\imath} + 2\hat{\jmath} + 3\hat{k})$ T.Calculate the Lorentz force acting on the proton.
3. State and write an expression for Biot-Savart's law in vector form. Derive an expression for magnetic field at the centre of a circular current carrying coil of radius r, with N turns.
4. Two identical coils P and Q each of radius R are lying in perpendicular planes such that they have a common centre. Find the magnitude and direction of magnetic field at the common centre of the two coils, if they carry currents equal to I and $\sqrt{3}$I respectively.
5. State and use an Ampere's circuital law, obtain the expression for the magnetic field due to an infinitely long conductor/wire carrying current.
6. What is a solenoid? Derive an expression for the magnetic field due to a long solenoid at a point inside the solenoid on its axis.
7. A straight thick long wire of uniform area of cross-section of radius a is carrying a steady current I. Calculate the ratio of magnetic field at a point a/2 above the surface of wire to that at a point a/2 below its surface. What is the maximum value of field of this wire?
8. A proton, a deuteron and alpha particle whose kinetic energies are same, enter perpendicularly in a uniform magnetic field. Compare the radii of their circular paths.
9. A solenoid of length 1·5m has a radius of 1·5cm and has a total of 1500 turns wound on it. It carries a current of 3A. Calculate the magnetic of the axial magnetic field inside the solenoid. If an electron were to move with a speed of 2×10^{4}m/s along the axis of the current carrying solenoid, what would be the force experienced by this electron?
10. Two long straight parallel conductors carrying I1 and I2 in the same direction. Deduce the expression for the force per unit length between them. Depict the pattern of magnetic field lines around them. Hence define one ampere.

CHEMISTRY

1. Standard electrode potential values E°of Al^{3+}/Al is -1.66 V and that of Tl^{3+}/Tl is +1.26 V . Predict about the formation of M^{3+} ion in solution and compare the electropositive character of the two metals.
2. PbO_2 is a stronger oxidising agent than SnO_2. Or PbO_2can act as an oxidising agent .why?
3. Select the member (s) of group 14 that (a) forms the most acidic dioxide (b) is commonly found in +2 oxidation state ,(c) is used as semiconductor (s).
4. Why does boron form covalent compounds?or why does boron not form B^{3+}
5. In which oxidation state thallium forms stable compounds and why?
6. Complex ions $[SiF_6]^{2-}$,$[PbF_6]^{2-}$ etc exist but $[CF_6]^{2-}$ does not why?
7. Why is the ionisation enthalpy of group 15 elements greater then those of corresponding group 16 elements?
8. Why is N_2 less reactive?
9. What is the order of stability basic character, bond angle and reducing power of NH_3,PH_3,AsH_3,SbH_3 and BiH_3.
10. Which is more covalent $SbCl_5$ or $SbCl_3$

BIOLOGY

1. Mention two function of codon AUG.
2. Name the enzyme involved in the continuous replication of DNA strand. Mention the polarity of template strand.
3. Mention the role of the codons AUG and UGA during protein synthesis?
4. Mention the contribution of genetic maps in human genome project
5. The length of a DNA moleculein a typical mammalian cell is calculated to be approximately 2.2 meters. How is the packaging of this long molecule done to accommodate it within the nucleus of the cell.
6. Explain the process of charging of tRNA. Why is it essential in translation?
7. (a) Draw the structure of the initiator tRNA adaptor molecule.
   (b) Why is tRNA called an adaptor molecule?
8. Given below is part of the template strand of a structural gene: TAT CAT TAG GAT
   (a) Write its transcribed mRNA strand with its polarity.
   (b)Explain the mechanism involved in initiation of transcription of this strand.
9. How is the translation of mRNA terminated ? Explain.
10. Draw a labelled schematic sketch of replication forkofDNA. Explain the role of the enzymes involved in DNA replication.

MATH

1. The curve $x + y - \log_e(x+y) = 2x+5$ has a vertical tangent at the point (α, β). Then $\alpha + \beta$ is equal to

2. Let C be the curve $y = x^3$ (where x takes all real values). The tangent at A meets the curve again at B. If the gradient at B is K times the gradient at A, then K is equal to

3. The equation of the line tangent to the curve $x \sin y + y \sin x = \pi$ at point $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$ is

4. The two curves $x = y^2$, $xy = a^3$ cut orthogonally at a point. Then a^2 is equal to

5. The tangent to the curve $y = e^{kx}$ at a point (0,1) meets the x-axis at (a,0), where $a \in [-2, -1]$. then $k \in$

6. The rate of change of the volume of a sphere w.rt. its surface area when the radius is 2cm , is

7. A cube of ice melts without changing its shape at the uniform rate of 4 cm^3/min. The rate of change of the surface area of the cube in cm^2/min, when the volume of the cube is 125 cm^3, is

8. The value of c in Lagrange's theorem for the function $f(x) = \log \sin x$ in the interval $[\pi/6, 5\pi/6]$ is

9. A continuous and differentiable function $y = f(x)$ is such that its graph cuts line $y = mx + c$ at n distinct points. Then the minimum number of points at which $f''(x) = 0$ is

10. The angle formed between the y – axis and the tangent to $y = x^2 + 4x - 17$ at (5/2,-3/4) is