

NEW STANDARD ACADEMY

Date : 02-12-24

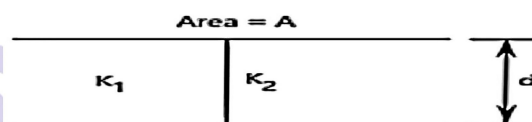
CLASS : 12TH

Marks: 60
Time: 3 HRS

PHYSICS

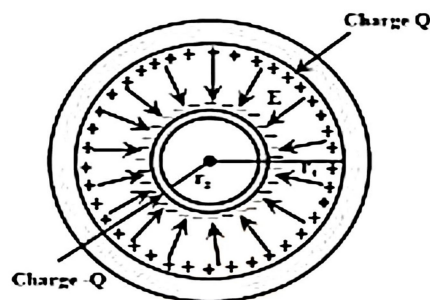
1. Derive an expression for the force acting on a current carrying conductor placed in a uniform magnetic field. Name the rule which gives the direction of the force. Write the condition for which this force will have (1) maximum (2) minimum value.
2. State Biot-Savarts law. Derive an expression for magnetic field at the center of a circular coil of n -turns carrying current $- I$.
3. A circular coil of wire consisting of 100 turns, each of radius 8.0 cm carries a current of 0.40A. What is the magnitude of the magnetic field B at the centre of the coil?
4. A square coil of side 10cm consists of 20 turns and carries a current of 12A . The coil is suspended vertically and the normal to the plane of the coil makes an angle of 30° with the direction of a uniform horizontal magnetic field of magnitude 0.80T. What is the magnitude of torque experienced by the coil?
5. A galvanometer coil has a resistance of 15Ω and the metre shows full scale deflection for a current of 4mA. How will you convert the metre into an ammeter of range 0 to 6A?
6. Two dielectric slabs of dielectric constant K_1 and K_2 are filled in between the two plates, each of area A of the parallel plate capacitor as shown in the figure. Find the net capacitance of the capacitor? Area of each plate $A/2$

7. Prove that energy stored per unit volume in a capacitor is given by $(1/2)\epsilon E^2$ where E



electric field of the capacitor.

8. A spherical capacitor consists of two concentric spherical conductors, held in position by



suitable insulating supports
Show that the capacitance of a spherical capacitor is given by $C = (4\pi\epsilon_0 r_1 r_2) / (r_1 - r_2)$ where r_1 and r_2 are the radii of outer and inner spheres, respectively.

9. A conducting slab of thickness t is introduced without touching between plates of a parallel plate capacitor separated by a distance d , $t < d$. Derive an expression for the capacitance of a capacitor?
10. A charge of 8mC is located at the origin. Calculate the work done in taking a small charge of -2×10^{-9} C from a point $P(0,0,3)$ cm to a point $Q(0,4,0)$ cm, via a point $R(0,6,9)$ cm.

CHEMISTRY

1. Explain and give one example of the following:
 - (a) Primary cell,
 - (b) Secondary cell,
 - (c) Fuel cell.
 - (d) Dry cell
 - (e) Cell used in hearing aids
2. Express the relation among the cell constant, resistance of the solution and conductivity of the solution. How is conductivity of a solution related to its molar conductivity?
3. Calculate the standard cell potentials of galvanic cell in which the following reactions take place:
 $2\text{Cr}(s) + 3\text{Cd}^{2+}(\text{aq.}) \rightarrow 2\text{Cr}^{3+}(\text{aq.}) + 3\text{Cd}(s)$
Also calculate Δ_r° and equilibrium constant for the reaction.
4. What happens when acetone is treated with the following:
 - (a) HCN
 - (b) NaOH solution
 - (c) Seori carbonize
 - (d) $\text{C}_2\text{H}_5\text{OH}/\text{HCl}$ gas
5. Write short notes on the following:
 - (a) Cannizzaro reaction
 - (b) Stephen's reaction
 - (c) Rosenmund reaction
6. What happens when acetic acid reacts with the following:
 - (a) PCl_5
 - (b) $\text{C}_2\text{H}_5\text{OH}/\text{H}_2\text{SO}_4$
 - (c) Na_2CO_3
7. Write the name structure & magnetic behavior of each one of the following complexes.
 - (a) $[\text{Pt}(\text{NH}_3)\text{Cl}(\text{NO}_2)]$
 - (b) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$
 - (c) $\text{Ni}(\text{CO})_4$
8. IUPAC norms write the formulae for the following:
 - (a) Sodium dicyanoaurate(I)
 - (b) Tetra amminechloridonitrito -N- platinum (IV) sulphate
9. On the basis of CFSE, write the electronic configuration of d^4 ion if $\Delta_0 < P$
10. A Voltaic cell is set up at 25°C with the half cells $\text{Ag}^+(0.001\text{M})|\text{Ag}$ and $\text{Cu}^{2+}(0.10\text{M})|\text{Cu}$
What should be its cell potential?
($E^\circ_{\text{cell}} = 0.46\text{V}$ $\log 10^5 = 5$)

BIOLOGY

1. In a certain population, the frequency of three genotypes is as follows
Genotypes: BB Bb bb
Frequency: 22% 62% 16%
What is the likely frequency of B and b alleles?
2. How does the process of natural selection affect Hardy-Weinberg equilibrium? Explain. List the other four factors that disturb the equilibrium.
3. What are interferons? Explain its role in providing immunity. Also name the kind of immunity provided by it.
4. What is allergy? Name the antibody responsible for it. Also mention two chemicals released from the mast cells during an allergic reaction.
5. Following are the steps in MOET programme for herd improvement in which a cow has been administered hormones with FSH like activity. Arrange steps A to D in their correct sequence.
A-Transferred to a surrogate mother.
B-It is either mated with an elite bull or artificially inseminated.
C-Fertilised eggs at 32 cell stage are recovered non surgically.
D-It produces 6-8 eggs instead of one egg which they normally yield per cycle
6. Name an opioid drug and its source plant. How does the drug affect the human body?
7. The barriers in the innate immunity are given below. Identify a, b, c and d

Type of barrier	Barrier
(i) Physical	Skin, a
(ii) Physiological	b, in the eye
(iii) c	Interferon
(iv) Cellular	WBC, d
8. How do cellular barriers and cytokine barriers provide innate immunity in humans?
9. List the two types of immunity a human body is with. Explain the differences between the two types.

10.

Fill in the blanks in the different column of the table given below:

Disease	Casual organisms	Medium of transfer	Symptoms
Amoebiasis	<i>Entamoeba histolytica</i>	a	Diarrhoea
Typhoid	b	Contaminated food	Sustained high fever
c	<i>Plasmodium</i>	Bite of infected female Anopheles mosquito	Chill and high fever
Pneumonia	<i>Streptococcus</i>	d	Fever and cough

MATHS

1. If $f'(x) = 4x^3 - \frac{3}{x^4}$ and $f(2) = 0$, find $f(x)$

2. Evaluate the integrals

$$\int \tan^{-1}(\operatorname{cosec} x + \cot x) dx$$

3. Evaluate

$$\int \cos 2x \cos 4x \cos 6x dx$$

4. Evaluate $\int \sin mx \sin nx dx$, where m, n are positive integers, $m \neq n$. What happens if $m=n$?

5. If $\int \frac{dx}{1+\sin x} = \tan\left(\frac{x}{2} + a\right) + b$, find the values of a and b .

6. Find all the anti-derivatives of the functions: $\frac{(x+1)(x+\log x)}{2x}$

7. Evaluate the integrals

$$\int \frac{1+\cot x}{x+\log \sin x} dx$$

8. If $\frac{d}{dx}[F(x)] = \frac{\sec^4 x}{\operatorname{cosec}^4 x}$ and $F\left(\frac{\pi}{4}\right) = \frac{\pi}{4}$, then find $F(x)$.

9. If $\int x^{-3} \cdot 5^{1/x^2} dx = k \cdot 5^{1/x^2} + C$, then find the value of k .

10. Find all the primitives of the following functions

(i) $\frac{x-2}{2x^2-8x+5}$

(ii) $\frac{x-1}{x(x-\log x)}$