pea
engineering & IT
Quiz
in association with HISSAN

National Level Quiz for +2 Science Studying Students

OBJECTIVE ROUND

(8 questions) (1mins/30sec/20sec/10sec)

1. **For two parallel lines AB and CD, each containing 10 and 20 points respectively, the number of triangles that can be formed equals:**

   a. 1600   b. 2500   c. 2800   d. 1200   e. 2400

   Answer: c

2. **If $\frac{d}{dx}[f(x)] = \ln x$ then $f(x)$ equals to:**

   a. $\ln \frac{x}{e}$ b. $\ln \frac{e}{x}$ c. $x \ln \frac{x}{e}$ d. $x \ln \frac{e}{x}$ e. $\frac{1}{x}$

   Answer: c

3. **In $\triangle$ ABC, if $r_1, r_2\, r_3$ are the lengths of the ex- radii, then the value of $r_1 r_2 + r_2 r_3 + r_3 r_1 =$**

   a. R^2 b. r^2 c. s^2 d. Δ^2 e. $(abc)^2$

   Answer: c

4. **The value of $\sin\left\{\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right\} =$**

   a. 1   b. $\frac{1}{2}$ c. -1 d. 0   e. $\frac{\sqrt{3}}{2}$

   Answer: b

5. **The value of the determinant $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} =$**

   a. 0   b. 1   c. abc d. ab+bc+ca   e. $4abc$

   Answer: a

6. **The sum of the series $\frac{2}{3!} + \frac{4}{5!} + \frac{5}{7!} + \cdots to\ \infty =$**

   a. e b. e + 1   c. $2e$ d. $e - 1$ e. e^{-1}

   Answer: e

7. **$\int \frac{\left(\tan^{-1} x\right)^2}{1+x^2}\, dx=$**

   a. $2\tan^{-1} x + c$ b. $\frac{\left(\tan^{-1} x\right)^3}{1+x^2} + c$ c. $\frac{\left(\tan^{-1} x\right)^3}{3} + c$ d. $\frac{1}{(1+x^2)^3} + c$ e. $\frac{2x}{1+x^2} + c$

   Answer: c

8. **If $|\vec{a}| = 2, |\vec{b}| = 3$, and $|\vec{a} \times \vec{b}| = 5$ then the value of $(\vec{a}.\vec{b}) =$**

   a. 16   b. 9   c. $\sqrt{17}$ d. $\sqrt{11}$ e. 7

   Answer: d

PHYSICS ROUND

(8 questions) (1 mins/30 sec/20 sec/10 sec)

1. Light of wavelength 7200Å in air has a wavelength in glass (μ = 1.5) equal to:
   a. 7200 Å   b. 4800 Å   c. 10,800 Å   d. 2400 Å   e. 6000 Å
   Answer: 4800 Å

2. What shunt is required to extend the range of Ammeter of internal resistance 0.9 Ω from 1A to 10 A?
   a. 0.01 Ω b. 0.1 Ω c. 1 Ω d. 5 Ω e. 10 Ω
   Answer: 0.01 Ω

3. Which of the following is the dimension of the ratio of electric flux to the magnetic flux?
   a. Velocity   b. Force   c. Acceleration   d. Momentum e. Energy
   Answer: Velocity

4. Force acting upon a charged particle kept between the plates of a charged capacitor is 'F'. If one of the plate of the capacitor is removed, force acting on the same particle becomes:
   a. 0   b. F/2   c. F   d. 2F   e. 4F
   Answer: F/2

5. The horizontal range of a projectile is $4\sqrt{3}$ times its maximum height. Its angle of projection with horizontal will be:
   a. 45°   b. 60°   c. 90°   d. 30°   e. 15°
   Answer: 30

6. A spring of spring constant 300N/m is cut into two parts of ratio 2:3 then spring constant for smaller part will be:
   a. 300N/m   b. 600 N/m   c. 500N/m   d. 900 N/m   e. 750N/m
   Answer: 750N/m

7. Two lenses have powers +2D and − 4D respectively are placed in contact, the power of their combination will be:
   a. +2D   b. −2D   c. −4D   d. +6D   e. −8D
   Answer: −2D

8. The half life period of a radioactive substance is 5min. The amount of substance decayed in 20min will be :
   a. 93.75%   b. 75%   c. 25%   d. 6.25%   e. 3.125%
   Answer: 93.75%

CHEMISTRY ROUND

(4 questions) (1 mins/30 sec/20 sec/10 sec)

1. When copper is heated with hot and conc. HNO_3 the product formed are
   a. $CuNO_3 + N_2O + H_2O$ b. $Cu(NO_3)_2 + NO_2 + H_2O$
   c. $Cu(NO_3)_2 + H_2O$ d. $Cu(NO_3)_2 + N_2O + H_2O$
   e. $Cu(NO_3)_2 + NH_4NO_3 + H_2O$
   Answer: b ($Cu(NO_3)_2 + NO_2 + H_2O$)

2. 'M' is the molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it is converted into K_2MnO_4 is :
   a. M   b. M/2   c. M/3   d. M/4   e. M/7
   Answer: M

3. Electrophiles are:

a. Electron loving species
b. Electron hating species
c. Nucleus loving reagents
d. Nucleus hating reagents
e. Lone pair containing species.

Answer: Electron loving species

4. **The PH of solution is 4 and it is diluted by 1000 times, what will be the PH of diluted solution?**

a. 4   b. 7   c. 6.69   d. 6.96   e. 8

Answer: 6.69

CREATIVE/VISUAL ROUND

(8 questions/options will not be given) (1 mins/30 sec/20 sec/10 sec)

1. **If the slope of the tangent at any point on the curve is equals to the ratio of abscissa to the ordinate of that point then the locus of the point is a:**

Answer: Hyperbola

2. **The latus rectum of the ellipse $3x^2 + 4y^2 = 12$ is:**
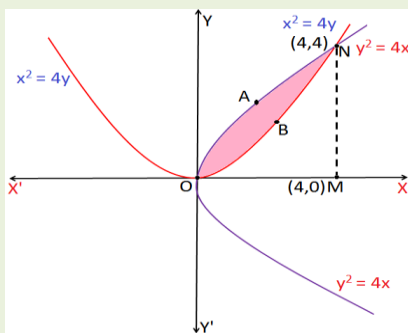
Answer: 3

3. **Maximum value of $f(x) = \sin x + \cos x$ on the entire set of all the real numbers is:**

Answer: $\sqrt{2}$

4. **Two lines represented by $ax^2 + 2hxy + by^2 = 0$ are perpendicular to each other if**

Answer: a+b=0

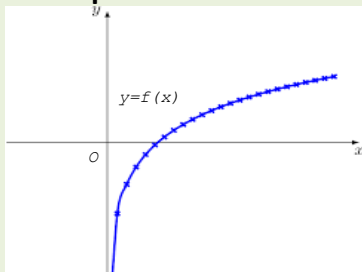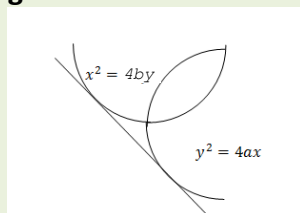5. **The area bounded by the curves shown in the figure is**

Answer: $\dfrac{16}{3}$

6. **Name the inverse function of the function shown in the graph.**
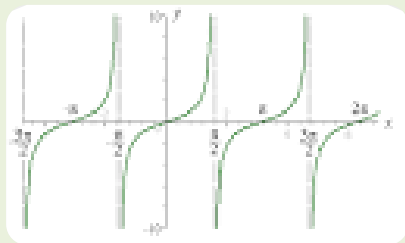
Answer: Exponential function

7. **The equation of the tangent common to both the curves shown in the figure is:**

Answer: $a^{\frac{1}{3}}x + b^{\frac{1}{3}}y + a^{\frac{2}{3}}b^{\frac{2}{3}} = 0$

8. **Indentify the function in the given figure:**

Answer: y = tanx

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RAPID FIRE ROUND

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(5 questions/ 2 minutes for each Team)
(Group -I)

1. **Unpaired electron in carbon atom is:**
   Ans: 2
2. **When lens is immersed in water then, its focal length will be?**
   Ans: Increases
3. **At equator, the angle of dip is:**
   Ans: 0^0
4. **The trace of the skew-symmetric matrix is:**
   Ans: 0
5. **The maximum and minimum values of the function** $f(x) = 3 - \cos x^0$ **are respectively:**
   Ans: 4 and 2

Questions for the Group-II, Group –III and Group-IV are not provided here. Calculator is allowed in all the round except Rapid Fire Round.

SYLLABUS

PHYSICS SYLLABUS

Mechanics:

Dimensions, Equations of motion, Motion of projectile. Laws of motion, Addition and subtraction of vectors, Relative velocity, Equilibrium of forces, Moments, Centre of mass, Centre of gravity, Solid friction, Work, power and energy, Conservation of energy, Angular speed, Centripetal force, Moment of inertia, Torque on a body, Angular momentum, Rotational kinetic energy, Laws of gravitation, Gravitational intensity, Gravitations potential, Velocity of escape, Simple harmonic motion, Energy of SHM, Hooke's Law, Breaking stress, Modules of elasticity, Energy stored in stretched wire, Surface tension phenomenon, Surface energy, Capillarity, Fluid pressure, Pascal law of transmission of fluid pressure, Archimedes' principle, Flotation Stokes' law, Terminal velocity.

Heat:

Heat and temperature, Temperature scale, Measurement of heat energy, Specific heat capacity, Latent heat, Saturated and Unsaturated vapour, Relative humidity and dew point, First law of thermodynamics, Reversible isothermal and adiabatic changes, Gas laws, Kinetic theory of gasses, second law of thermodynamics, Carnot's engine, Transfer dof heat, Conduction, Convection and radiation, Expansion of solid, liquid and gass.

Optics:

Formation of images by plane and curves mirrors, Refraction of light through plane surfaces. Total internal reflection, Critical angle, Refraction through prism, Maximum and minimum deviation, formation of images by lenses, Dispersion, Achromatic combination of lenses visual angle, Angular magnification Defect of vision, Telescope and microscope, Wave theory of light: introduction to Huygen's principle and its application interference diffraction and polarization of light.

Sound: Damped vibration, Forced oscillation, Resonance, Progressive waves, Principle of superposition, Velocity of sound in solid, liquid and gas: Laplaces correction, Characteristics of Sound wave, Beat phenomenon, Doppler effect, Stationary waves, Waves in pipes, Waves in String.

Electricity:

Electric charge, Gold leaf electroscope, Charging by induction Faraday's ice pail experiment, Coulomb's law, Permitivity, Electric field, Gauss's law and its application, electric potential, Capacitors, Ohm's law, Resistance − combination of resistances, emf, Kirchhoff's law and its application, Heating effect of current, Thermoelectricity, Chemical effect of current, Potentiometer, Wheatstone bridge, Galvanometer, Conversion of galvanometer into voltmeter and ammeter. Magnetic Field, Earth's magnetism, Magnetic Flux, Force on a current carrying conductor, Ampere's law, Biot-Savart's law and their applications, Solenoid, Electromagnetic induction, AC circuits.

Atomic Physics and Electronics:

Discharge electricity through gases, Cathode rays, Electronic mass and charge Bohr's theory of atomic structure, Energy level, X-rays, Photoelectric effect Radioactivity, Nuclear−fission and fusion, Semiconducts, Junction Transistor.

CHEMISTRY SYLLABUS

Language of Chemistry & Physical Chemistry:

Symbols, formulate valency and chemical questions, Problems based on chemical equations (relation with weight and weight, and weight and volume.

Atomic Structure:

Study of Cathode rays, and discovery of electrons, Rutheford's X-ray scattering experiment and discovery of nucleus. Rutheford model of atom., Bohr model of atom, Elementary concept of quantum numbers, Electron configuration of the elements.

Electronics Theory to Valency:

Octet rule, Electrovalency, covalency and coordicatevalency, General characteristics ionic and covalent compounds.

Oxidation and Reduction:

Classical definitions, Electronic interpretations of oxidation and reduction, Balancing of redox equations by oxidation number method.

Periodic Classification of Element:

Mendeleev's periodic Law, Periodic Properties viz. Ionization potential, electronegativity and atomic radii, and their variation in the periodic table; Equivalent weight and Atomic: Concept of equivalent weight, and its determination by hydrogen displacement method and oxide method, Concept of atomic weight, equivalent weight and valency, determination of atomic weight using Dulong and Petit's rule.

Molecular Weight and Mole:

A vogardo's hypothesis and its deductions, Avogadro number and concept of mole, Determination of molecular weight by Victor Meyer's method; Electro-Chemistry; Electrolytes and non-electrolytes, strong electrolytes and weak electrolytes, Faraday's laws of electrolysis, Solubility product principle and its application in qualitative analysis; Theories of Acids and Bases: Arrhenius theory, Bronsted and Lowry theory,

Lewis theory; Volumetric Analysis Equivalent weights of acids, base and salts, Principles of acidimetry and alkalimetry, pH and pH scale.

Non-Metals:

Water: Hard water and soft water, Causes and removal of hardness of water; Nitrogen and its Compounds: Nitrogen cycle, Preparation of ammonia and nitric acid in the lab, and their properties, Manufacture of ammonia and nitric and, Sulphur and its Compound.

Allotropy of sulphur, Preparation of hydrogen sulphide, Sulphure dioxide in the lab, and their properties, Manufacture of sulphuric acid by contact process; Halogens and Their Compound: Position of halogens in the periodic table, Preparation of chlorine and hydrogen chloride in the lab, and their properties.

Metals:

Compounds of Metals: General methods of preparation and properties of oxides, hydroxides, chlorides, nitrates, sulphates and carbonates of metals; Sodium: Extraction of Sodium (Down's process), Manufacture of caustic soda sodium carbonate; Copper: Extraction of copper from copper pyrite, Manufacture of Blue vitriol; Zinc: Extraction of zinc from zinc blend, Galvanization; Iron: Extraction of cast iron from hematite, Cast iron, steel and wrought iron, Types of steel, Manufacture of steel.

Organic Chemistry:

Sources and Purification of organic Compounds: Characteristics of Organic compounds, Sources of organic compounds, Purification of organic compounds; Classification and nomenclature of organic Compounds: Functional group, homologous series, and isomerism (structural only), Classification of organic compounds, Common names, and I.U.P.A.C. naming system.

Saturated and unsaturated Hydrocarbons & Aeromatic compound:

Preparation and properties of methane, Preparation and properties of ethylene and acetylene, Alkyl Halides: Preparation and properties of ethyl iodide; Aromatic Compounds: Structure of benzene, Preparation of benzene in the laboratory, Properties of benzene.

MATHEMATICS SYLLABUS

Set and Function:

Set and relations, Functions and graphs, Algebraic, Trigonometric, Exponential, Logarithmic and hyperbolic functions and their inverses.

Algebra:

Determinants, matrices, Inverse of a matrix, uses of complex numbers, Polynomial equations, sequence and series, Permutation and combination, Binomial theorem, Exponential, Logarithmic series.

Trigonometry:

Trigonometric equations and general values, Inverse trigonometric functions, Principal values, properties of triangles; Centroid, Incentre, Orthocentre and Circumcentre and their properties.

Coordinate Geometry:

Coordinates in a plane, Straight lines, Pair of lines, Circles, Conic sections: Parabola, Ellipse and Hyperbola, Standard equations and simple properties, Coordinates in space, Plane and its equation.

Calculus:

Limit and continuity of functions, Derivatives and application of derivative−Tangent and normal, Rate of change, differentials dy and actual change Δy. Maxima and Minima of a function; Antiderivatives (Integrations): rule of Integration, Standard Integrals, Definite integral as the limit of a sum. Application to areas under a curve and area between two curves.

Vectors:

Vectors in space, addition of vectors, Linear combination of vectors, Linearly dependent and independent set of vectors, Scalar and vector product of two vectors, simple applications.

Prizes, Scholarships & Gifts Hampers

Winner	Full Scholarship for B.E. Program at ADVANCED COLLEGE OF ENGINEERING & MANAGEMENT, Cash Prize Rs. 1,00000|-, Free Recorded Video classes of PEA Mentors for Engineering/IT Entrance Preparation, Medal, Trophy and Certificate, Full Scholarship for Engineering Preparation Classes in PEA Association, Two Laptops
1st Runner UP	Full Scholarship for B.E. Program at COSMOS COLLEGE OF MANAGEMENT & TECHNOLOGY, Cash Prize Rs. 50000|-, Free Recorded Video classes of PEA Mentors for Engineering/IT Entrance Preparation, Medal, Trophy and Certificate, Full scholarship for engineering preparation classes in PEA Association
2nd Runner UP	Full Scholarship for B.E. Program at WHITE HOUSE INTERNATIONAL COLLEGE, Cash Prize Rs. 25,000|-, Free Recorded Video classes of PEA Mentors for Engineering Entrance preparation for Engineering/IT Entrance Preparation, Medal, Trophy and Certificate, Full scholarship for engineering preparation classes in PEA Association
Consolation Prize	Free Recorded Video classes of PEA Mentors for Engineering/IT Entrance Preparation, Medal, Trophy and Certificate, Full Scholarship for Engineering Preparation Classes at PEA Association, Medal, Trophy, Certificate, special gift hamper and Cash Prize Rs. 10,000|-, 60% Scholarship in BE Program at White House International College
Provincial Topper	Free Recorded Video classes of PEA Mentors, Medal, Trophy and Certificate, Full Scholarship for Engineering Preparation Classes at PEA Association, Medal, Trophy, Certificate, special gift hamper and Cash Prize Rs. 10,000|-, 50% Scholarship in BE Program at White House International College
Participation Prize	Free Premium Subscription of PEA-Engineeringdote App (A complete online Engineering/IT Entrance Preparation Platform), 25% Scholarship in PEA's Engineering/IT Entrance-2023, 50% Scholarship in 260 hrs recorded lecture videos prepared by PEA Mentors for Engineering/IT Entrance Preparation

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