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1249

Your Roll No.

B.Sc. (Hons.)/I

A

CHEMISTRY – Paper V

(Physics – I)

Time : 3 Hours

Maximum Marks : 38

(Write your Roll No. on the top immediately
on receipt of this question paper.)

Question No. 1 is compulsory.

Choose at least two questions from Section B and C.

SECTION A

1. Attempt any five : (5x2=10)

(a) Prove that for any three vectors \vec{a} , \vec{b} and \vec{c}

$$\left(\vec{a} \times \vec{b}\right) \times \vec{c} + \left(\vec{b} \times \vec{c}\right) \times \vec{a} + \left(\vec{c} \times \vec{a}\right) \times \vec{b} = 0$$

(b) Show that gradient of scalar function is irrotational.

(c) Prove that, $\vec{\nabla} f(r) = \frac{f'(r)}{r} \vec{r}$;

where symbols have usual meaning.

P.T.O.

(d) Evaluate $\int_2^3 \vec{A} \cdot \frac{d\vec{A}}{dt} dt$;

if $A(2) = 3\hat{i} + 2\hat{j}$; and

$$A(3) = 5\hat{i} - 4\hat{j} + 2\hat{k};$$

(e) Evaluate $\iint_S \vec{r} \cdot \hat{n} dS$, where 'S' is a surface of a cube of side 2 units.

(f) Define scalar and vector fields. Also give one example for each.

(g) Find the directional derivative of a scalar field,

$$\phi(x, y, z) = x^2yz + 4xz^2; \text{ at}$$

$$(1, -2, -1) \text{ in the direction of } 2\hat{i} - \hat{j} - 2\hat{k}.$$

SECTION B

2. (a) Show that for a particle moving under a central force, the angular momentum of the particle is always conserved. (3)

(b) A sphere, a disc, a spherical shell, a ring and a cylinder are allowed to roll down simultaneously on inclined plane from the same height without slipping. Which will reach down first. Also, explain how does the concept of Pseudo force come in the case of rotational motion? (3,1)

3. (a) State and prove Parallel axis theorem. (3)
- (b) Find the moment of Inertia about a tangent of a solid sphere of mass 'M' and radius 'R'. (4)
4. (a) What is damped Harmonic-oscillator? Solve its differential equation with all cases and discuss in detail the "Under damped case". (1,3,1)
- (b) What change will you observe in the case of Lissajous-Figures formed by two perpendicular S.H.M.'s, where frequency of one is twice of other, is reversed. (2)

SECTION C

5. What is "Interference"? What is qualitative difference between Interference of light and sound waves? Also describe Young's double slit experiment in detail. (1,1,5)
6. What is "Zone plate" and how it is made? Explain how a Zone plate acts like a convergent lens having multiple focii. Derive an expression for its focal-length. (2,2,3)

7. (a) Define "Polarization of light". Also distinguish between "unpolarised light", "polarised-light", "circularly polarised light" and "elliptically polarised light". (1,3)
- (b) Calculate the thickness of a double-refracting plate capable of producing a path difference of ' $\lambda/4$ ' between E-wave and O-waves. (3)