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| **PT1/PHQP/1223/B 17-APR-2023** | | | | |
| **PERIODIC TEST – I (2023-24)** | | | | |
| **Subject: PHYSICS**  **Grade: XII** | | Max. Marks: 35Time:1 hour 15 mins | | |
| **Name:** | | **Section:** | **Roll No:** | |
| **General Instructions:**   * All questions are compulsory * This question paper has four sections: section A, Section B, Section C and Section D. * Section A contains EIGHT questions of one mark each, Section B contains FIVE questions of two marks each, Section C contains FIVE questions of three marks each, Section D contains ONE question of five marks. * All answers to be written in the answer sheet provided. | | | | |
|  | **SECTION A(1 MARK)** | | |  |
| **1.** | In an experiment three microscopic latex spheres are sprayed into a chamber and became charged with charges +3e, +5e and −3e respectively. All the three spheres came in contact simultaneously for a moment and got separated. Which one of the following are possible values for the final charge on the spheres?   1. +5e, −4e, +5e 2. +6e, +6e, −7e 3. −4e, +3.5e, +5.5e 4. +5e, −8e, +7e | | | 1 |
| **2** | The electric field in a charged spherical conductor is:   1. Zero inside and outside the sphere 2. Maximum inside the sphere and zero outside the sphere 3. Zero inside the sphere and decreases outside the sphere with increase of square of distance. 4. d)maximum inside the sphere and decreases outside the sphere with increase of distance. | | | 1 |
| **3.** | Four charges are arranged at the corners of a square ABCD, as shown. The force on a +ve charge kept at the center of the square is     1. Zero 2. Along diagonal AC 3. Along diagonal BD 4. Perpendicular to the side AC | | | 1 |
| **4** | An electric dipole of dipole moment p is placed in a uniform electric field E.The angle between p and E where the value of torque actiing on the dipole maximum is :   1. 900 2. 00 3. 1800 4. 450 | | | 1 |
| **5.** | The electric flux from a cube of edge l is ϕ. If the edge of the cube is made 2l and the charge enclosed is halved, the flux value will be.   1. ϕ. 2. ϕ/3 3. ϕ/2 4. 2 ϕ | | | 1 |
|  | The questions given below consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses   1. If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion. 2. If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion. 3. If the Assertion is correct but Reason is incorrect. 4. If both the Assertion and Reason are incorrect. | | |  |
| **6.** | **Assertion:** In a cavity in a conductor, the electric field is zero.  **Reason:**Charges in a conductor reside only at its surface. | | | 1 |
| **7.** | **Assertion:**The flux over the Gaussian surface depends on all the charges inside and outside the surface  **Reason:** Electric flux does not depend on all charges nearby. | | | 1 |
| **8.** | **Assertion:**  When bodies are charged through friction, there is a transfer of electric charge from one body to another, but no creation or destruction of charge. **Reason:** This follows from conservation of electric charges. | | | 1 |
|  | **SECTION B** | | |  |
| **9.** | a) Sketch the electric field lines of a dipole  b) Explain why two field lines never cross each other at any point? | | | 2 |
| **10.** | Derive the expression of torque experienced by an electric dipole placed in a uniform electric field? Draw the necessary diagram. | | | 2 |
| **11.** | A point charge +10 µC is a distance 5 cm directly above the centre of a square of side 10 cm, as shown in the figure. What is the magnitude of the electric flux through the square? | | | 2 |
| **12.** | a) What is electric dipole moment? Give its SI unit?  b) For short dipole find the ratio of electric field intensities at two equidistant points from the centre of the dipole ,one along the axial line and the other on the equatorial line ? | | | 2 |
| **13.** | State Coulomb’s law? Show that Coulomb’s law obeys newton’s third law. | | | 2 |
|  | **SECTION C** | | |  |
| **14.** | An electric field is uniform, and in the positive x direction for positive x, and uniform with the same magnitude but in the negative x direction for negative x. It is given that E = 200 ˆi N/C for x > 0 and E = –200 ˆi N/C for x < 0. A right circular cylinder of length 20 cm and radius 5 cm has its centre at the origin and its axis along the x-axis so that one face is at x = +10 cm and the other is at x = –10 cm as shown in the figure given below  a) What is the net outward flux through each flat face?  b) What is the flux through the side of the cylinder?  c) What is the net outward flux through the cylinder?  **OR**  A disk with radius r = 0.10 m is oriented with its normal unit vector n at an angle of 30o to a uniform electric field E with magnitude 2.0\*103 N/C as shown in the diagram given below.  r=0.10m 38 30°   1. What is the electric flux through the disk? 2. What is the flux through the disk if it is turned so that its normal is perpendicular to the direction of electric field? 3. What is the flux through the disk if it is turned so that its normal is parallel to the direction of electric field? | | | 3 |
| **15.** | Derive the expression of electric intensity at a point lying on the axial line of an electric dipole? | | | 3 |
| **16.** | a) Two point charges q1 and q2 are placed at a distance d apart as shown in the figure. The electric field intensity is zero at a point P on the line joining them as shown. Write two conclusions that you can draw from this.  Shape, rectangle  Description automatically generated  b) Two fixed-point charges +4e and +e units are separated by a distance a. Where should the third point charge be placed for it to be in equilibrium? | | | 3 |
| **17.** | Two-point charges *q*A = 3 μC and *q*B = −3 μC are located 20 cm apart in vacuum.  **(a)** What is the electric field at the midpoint O of the line AB joining the two charges?  **(b)** If a negative test charge of magnitude 1.5 × 10−9 C is placed at this point, what is the force experienced by the test charge? | | | 3 |
|  | **SECTION D** | | |  |
| **18.** | 1. Find the expression for the electric field (E) due to a straight uniformly charged infinite line of charge density λ C/m 2. Draw a graph to show the variation of E with perpendicular distance r from the line of charge. 3. S1 and S2 are two hollow concentric spheres enclosing charges Q and 2Q respectively as shown below. i) What is the ratio of the electric flux through S1 and S2? ii) How will the electric flux through S1 change, if a medium of dielectric constant 5 is introduced in the space inside S1 instead of air?   **OR**   1. Using Gauss’s law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it. 2. How is the field directed if (i) the sheet is positively charged, (ii) negatively charged? 3. c)Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude 17.0 × 10–22 C/m2 . What is Electric field : (i) in the outer region of the first plate, (ii) in the outer region of the second plate, and (iii) between the plates? | | | 5 |

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