Maharaja Agrasen Model School, PitamPura

SAMPLE QUESTION PAPER, Physics

MAX.MARKS- 70 TIME- 3 HOURS

General Instructions:

(i) All questions are compulsory.

(ii) Question numbers 1 to 5 are very short answer type questions, carrying one mark each.

(iii) Question numbers 6 to 10 are short answer type questions, carrying two marks each.

(iv) Question numbers 11 to 22 are also short answer type questions, carrying three marks each.

(v) Question number 23 is value based question, carrying 4 marks.

(vi) Question numbers 24 to 26 are long answer type questions, carrying five marks each.

(vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

(viii) You may use the following values of physical constants wherever necessary

1.Draw the equipotential surfaces for two point charges each of magnitude $q > 0$ placed at

Somefinite distance?

2. A bar magnet of dipole moment M is cut into two equal parts along its axis. What is the new polestrength of each part.

3. A rod of length L, along East-West direction is dropped from a height H. if B be the magnetic Field due to earth at that place and angle of dip is , then what is the magnitude of induced emf acrosstwo ends of the rod when the rod reaches the earth?

4. Which characteristic of the following electromagnetic waves (i) increases (ii) remains same as we move along -radiation, ultraviolet rays, microwaves and radio waves?

5.Twopolaroids are placed with their optic axis perpendicular to each other. One of them is rotated through 45° what is the intensity of light emerging from the second polaroid if I_0 is the intensity ofunpolarised light?

6.Four equal charges $+q$, $-q$ and $+q$ are placed at the vertices *P, Q* and *R* of an equilateral triangle of side '*a*'. What is the electric potential at the centre of the triangle? How will your answer changeif position of charges at *P* and *Q* are interchanged?

7.. What are ohmic and non-ohmic conductors? Give one example of each. Why can one not Measure the resistance of a *p-n* junction is measured by using a voltmeter?

8. A charged particle enters a magnetic field perpendicular to it. The particle follows a zigzag path and comes out of it. What happens to its velocity and kinetic energy of the particle? Justify your answer.

9.Two solenoids each of length L are wound over each other. A_1 and A_2 are the areas of the outer and inner solenoids and N_1 and N_2 are the no. of turns per unit length of the two solenoids. Write the expressions for the self-inductances of the two solenoids and their mutual inductance. Hence Show that square of the mutual inductance of the two solenoids is less than the product of the self Inductances of the two solenoids.

10. Why two equipotential surfaces do not intersect each other? A charge q_0 is placed at the centre of a conducting sphere of radius R, what is the work done in moving a charge *q* from one point to other diametrically opposite along the surface of the sphere?

11. In and LCR circuit if frequency of the supply is made 4 time, how should the values of *C* and *L* be changed so that there is no change in the current in the circuit.

OR

The series LCR circuit is in resonance state. What is the voltage across theinductor?

12. Arrange the following in ascending order of frequency X-rays, green light, red light, microwaves, -radiation. Which characteristic of the above waves is same for all?

13. A ray of light travels through an equilateral triangular prism at an angle of incidence *i*and Emerges out at and angle of emergence *e* write the expression for the angle of deviation relating *i, e* and *A* (angle of the prism). If the ray undergoes a minimum deviation of 30° then what is the refractiveindex of the material of the prism?

14. A radio active material after 10 days reduces to 6.25%. If 40 g sample is taken then in how many

days only 5g of the material is left?

15. What is ground wave communication? Why can it not be used for long distance using high frequency?

16. An electric dipole of moment ***p*** is placed in a uniform electric field ***E.*** Derive the expression for the potential energy of the dipole and show diagrammatically the orientation of the dipole in the field for which the potential energy is (i) maximum (ii) minimum.

OR

Two capacitors C_1 and C_2 are charged to potential V_1 and V_2 respectively and then connected in parallel. Calculate (i) common potential, (ii) charge on each capacitor, (iii) electrostatic energy in the system after connection.

17. What are the characteristics of the objectives lens of an objective lens of and astronomical telescope? Derive the expression for the magnifying power of astronomical telescope in normal adjustment.

18. Calculate the de-Broglie wavelength of (i) an electron accelerated by a potential difference of 100V and (ii) a particle of mass 0.03 kg moving with a speed of 100ms^{-1}. Hence show that wavelength of the particle is not relevant.

19. In a plane electromagnetic waves progressing towards –x-axis, the electric field oscillates sinusoidally at a frequency of 2.0 x 10^{10} Hz and amplitude 48 Vm^{-1} along –z-axis. Write the expression for the electric field and the magnetic field.

20. Name the series of hydrogen which does not lie in visible region?

The wavelength of first member of Lyman series is 1216 Å. Calculate the wavelength of third member of Lyman series.

21. The height of a transmission antenna is 600m find the area covered by the antenna in which the signal from the antenna can be received.

22. Draw the circuit diagram to draw the characteristics of common emitter *npn*transistor. Also draw the input and output characteristics of the transistor.

23. In Akash's classroom the fan above the teacher was running very slowly. Due to which his

teacher was sweating and was restless and tired. All his classmates wanted to rectify this. They called for an electrician who came and changed the capacitor only after which the fan started running fast.

a. What values did Akash and his classmates have?

b. What energy is stored in the capacitor and where?

24. Derive the formula for the equivalent emf and internal resistance of the parallel combination of

The cells of emfE_1 and E_2 and internal resistance r_1 and r_2 respectively. Two cells of emf 1V and 2Vand internal resistance 2 and 1 respectively connected in (i) series (ii) parallel. What should be the value of external resistance in the circuit so that the current through the resistance be the same in the two cases? In which case more heat is generated in the cells?

OR

Two cells of emf 1.5V and 2.0V and internal resistance 1 and 2 respectively are connected in parallel so as to send current in the same direction through an external resistance of 5 .

(a) Draw the circuit diagram. (b) Using Kirchhoff's laws, calculate current through each branch of thecircuit and potential across the 5 resistance.

25. Write the principle, working of moving coil galvanometer with the help of neat labelled diagram. What is the importance of radial field and phospher bronze used in the construction of moving coil galvanometer?

OR

(i).A beam of alpha particular and of protons, enter a uniform magnetic field at right angles to the field lines. The particles describe circular paths. Calculate the ratio of the radii two paths if they have same (a) velocity, (b) same momentum, (c) same kinetic energy.

(ii) A beam of -particles and of protons of the same velocity u enters a uniform magnetic field at right angles to the fields lines. The particles describe circular paths. What is the ratio of the radii of the two circles?

26. (i) Using the relation for the refraction at a single spherical refracting surface, derive lens maker's formula for a thin convex lens.

(ii) The radius of curvature of either face of a convex lens is equal to its focal length. What is the refractive index of its material?

OR

(i) Deduce the relationship between the object distance, image distance and the focal length for a mirror. What is the corresponding formula for a thin lens?

(ii) Two lenses of powers +15D and –5D are in contact with each other forming a combination lens. (a) What is the focal length of this combination? (b) An object of size 3cm is placed at 30cm from this combination of lenses. Calculate the position and size of the image formed.