**Guess Paper- 2013**

**Subject: PHYSICS**

**Class 12th**

M.M 70 TIME: 3 Hours

**GENERAL INSTRUCTIONS :**

1. **All questions are compulsory.**
2. **There are 29 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 16 carry two marks each, questions 17 to 25 carry three marks each, question 26 carry four marks and questions 27 to 29 carry five marks each.**
3. **There is no overall choice. However ,an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choices in such questions.**
4. **Use of calculators is not permitted.**
5. **You may use the following physical constants wherever necessary :**

 **c = 3 x 108 ms-1 h=6.6 x 10-34 Js e=1.6 x 10-19 C**

$\frac{1}{4πε\_{0}}$ **=9 x 109 Nm2 C-2 µ0=4π x 10-7 TmA-1 ε0= 8.85 x 10-12 C2N-1m-2**

Q.1 In the given figure , bar magnet is quickly moved towards a conducting loop having a capacitor . Predict the polarity of the plates A and B of the capacitor.

 

Q.2 Where on the surface of earth is the vertical component of earth’s magnetic field zero ?

Q.3 What is the meaning of the term attenuation in communication system ?

Q.4 A biconvex lens has a focal length 2/3 times the radius of curvature of either surface . Calculate the refractive index of lens material.

Q.5 A charge q is placed at the centre of a cube of side *l.* What is the electric flux passing through each face of the cube ?

Q.6 Two semiconductor materials A and B shown in the given figure, are made by doping germanium crystal with arsenic and indium respectively. The two are joined end connected to a battery as shown. (i) Will the junction be forward biased or reverse biased ?

 (ii) Sketch a V-I graph for this arrangement.

 

Q.7 What is space wave communication ? Write the range of frequencies suitable for space wave communication.

Q.8 The instantaneous current and voltage of an AC circuit are given by, I=10 sin314t A and V=50 sin 314t volt. What is the power dissipation in the circuit ?

Q.9 Laser light of wavelength 630 nm, incident on a pair of slits produces an interference pattern in which the bright fringes are separated by 7.2 mm. Calculate the wavelength of another source of laser light which produces interference fringes separated by 8.1 mm using same pair of slits.

Q.10) Net capacitance of three identical capacitors in series is 1 µF. What will be their net capacitance if connected in parallel ? Find the ratio of energy stored in the two configurations if they are both connected to the same source.

 OR

 Two identical metallic spherical shells A and B having charges +4Q and -10Q are kept a certain distance apart. A third identical uncharged sphere C is first placed in contact with sphere A and then with sphere B, then spheres A and B are brought in contact and then separated . Find the charge on the spheres A and B.

 Q.11 Write Einstein’s photoelectric equation. State clearly the three salient features observed in photoelectric effect, which can be explained on the basis of above equation.

Q.12 Conductor of length *l* is connected to a DC source of potential V. If the length of the conductor is tripled by gradually stretching it, keeping V constant , how will

 (i) drift speed of electrons and (ii) the resistance of the conductor be affected ? Justify your answer.

Q.13 Figure shows two identical capacitors C1 and C2 each of 1.5 µF capacitance, connected to a battery of 2 V. Initially switch S is closed. After some time S is left open and dielectric slabs of dielectric constant K=2 are inserted to fill completely the space between the plates of the two capacitors. How will the (a) charge and (b) potential difference between the plates of the capacitors be affected after the slabs are inserted ?

 

 Q.14 A cyclotron when being used to accelerate positive ions ( Mass= 6.7 x 10-27 kg , charge =3.2 x 10-19 C) has a magnetic field of π/2 T. What must be the value of the frequency of the applied alternating electric field to be used in it ?

Q. 15 (a) For what kinetic energy of a neutron will the associated de-Broglie wavelength be 1.40 x 10-10 m ? (b) Also find the de-Broglie wavelength of a neutron, in thermal equilibrium with matter , having an average kinetic energy of $\frac{3}{2}$ kT at 300 K.

Q.16 Draw the (a) symbol and (b) the reverse I-V characteristics of a Zener diode . Explain briefly , which property of the characteristics enables us to use Zener as voltage regulator.

 Q.17 Determine the current in each branch of the network shown in figure.

 

 Q. 18 The energy of the electron in the ground state of hydrogen is -13.6 eV. Calculate the energy of the photon that would be emitted if the electron were to make a transition corresponding to the emission of the first line of the (a) Lyman series (b) Balmer series of the hydrogen spectrum.

 Q 19 Using Huygen’s geometrical construction of wavefronts, show how a plane wave gets reflected by a plane, reflecting surface. Hence , verify laws of reflection.

Q.20 An electron moves around the nucleus in a hydrogen atom of radius 0.51 A0 with a velocity of 2 x 105 m/s. Calculate the following

 (a) The equivalent current due to orbital motion of electron.

 (b) The magnetic field produced at the centre of the nucleus.

 (c) The magnetic moment associated with the electron.

 Q.21 A compound microscope uses an objective lens of focal lengths 4 cm and eyepiece lens of focal length 10 cm. An object is placed at 6 cm from the objective lens. Calculate the magnifying power of the compound microscope. Also calculate the length of the microscope.

Q.22 Draw a plot of binding energy per nucleon (BE/A) versus mass number (A) for a large number of nuclei lying between 2<A<240 .Using this graph , explain clearly how the energy is released in both the process of nuclear fission and fusion ?

 OR

Draw the graph to show variation of binding energy per nucleon with mass number of different atomic nuclei . Calculate binding energy/nucleon of 20Ca40 nucleus.

 Given , mass of 20Ca40= 39.962589 u, mass of proton=1.007825 u, mass of neutron=1.008665u and 1 u= 931 MeV/c2

Q.23 Write briefly any two factors which demonstrate the need for modulating a signal. Draw a suitable diagram to show amplitude modulation using a sinusoidal signal as the modulating signal.

Q24. A parallel plate capacitor is charged by a battery. After sometime , the battery is disconnected and a dielectric slab of dielectric constant K is inserted between the plates. How would

1. The capacitances (b) the electric field between the plates and

(c)the energy stored in the capacitor , be affected ? Justify your answer .

 Q25. Write any four characteristics of electromagnetic waves. Give two uses each of

1. Radiowaves (ii) microwaves

 Q26. On a field Ram and Shyam were playing football. Suddenly , a player kicked out the ball outside the field and the ball reached an electric power substation. One of the players was planning to go and bring back the ball to the field but, Ram and Shyam stopped him saying that it is dangerous to go to the substation as warmed up body can be caught by the strong magnetic field, which is created by high voltage current in conductions of the switchyard and that may result in death.

1. Ram and Shyam are the student of class 12. Consider yourself as this friend and give your opinion about them.
2. There is a conductor of length L in a magnetic field B, current i flows through the conductor. Calculate the force acting on the conductor ( B= constant)

 Here magnetic field B is also produced by the current flowing in the conductor other than the considered conductor.

 Q27. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series L-C-R circuit in which R=3 Ω, L=25.48 mH and C=796 µF. Find (a) the impedance of the circuit (b) the phase difference between the voltage across the source and the current (c) the power dissipated in the circuit and (d) the power factor.

 OR

1. With the help of a labeled diagram, describe briefly the underlying principle and working of a step-up transformer.
2. Write any two sources of energy-loss in a transformer.
3. A step-up transformer converts a low input-voltage into a high output-voltage. Does it violate law of conservation of energy ? Explain.

Q28. (a) Draw the circuit arrangement or studying the input and output characteristics of an n-p-n transistor in CE configuration. With the help of these characteristics define

(i) input resistance (ii) current amplification factor

(b) Describe briefly with the help of a circuit diagram how an n-p-n transistor is used to produced self-sustained oscillations.

 OR

 (a) Draw the circuit diagram of a p-n junction diode in

 (i) forward bias (ii) reverse bias

How are the circuits to study the V-I characteristics of a silicon diode ? Show the typical V-I characteristics.

(b) What is a Light Emitting Diode (LED) ? Mention two important advantage of LEDs over conventional lamps.

Q29. (a) Obtain lens maker’s formula using the expression

 $\frac{n\_{2}}{v}-\frac{n\_{1}}{u}=\frac{n\_{2}-n\_{1}}{R}$ Here the ray of light propagating from a rare medium of refractive index

(n1) to a denser medium of refractive index (n2) is incident on the convex side of spherical refracting surface of radius of curvature R.

(b)Draw a ray diagram to show that image formation by a concave mirror when the object is kept between its focus and the pole. Using this diagram, derive the magnification formula for the image formed.

 OR

 With the help of ray diagram, explain the formation of image in an astronomical telescope

 for a distant object. Derive an expression for its magnifying power when the final image is

 formed at the least distance of distinct vision.

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