CBSE Guess Paper – 2015

Class – XII

Subject - Physics

General Instructions For Set-1 and Set-2

- **All questions are compulsory.**
- **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 questions of five marks. You have to attempt only one the choice in such questions.**
- **Question numbers 1 to 8 are very short answer type questions, carrying one mark each.**
- **Questions numbers 9 to 16 are short answer type questions carrying two marks each.**
- **Question numbers 17 to 25 are also short answer type questions, carrying 3 marks each.**
- **Question numbers 26 value based type question, carrying four marks.**
- **Question numbers 27 to 29 are long answer type questions, carrying five marks each.**
- **Use of calculators is not permitted. However, you may use log tables, if necessary.**
- **You may use the following values of physical constants wherever necessary:**
  $C = 3 \times 10^8$ ms^{-1}, $h = 6.626 \times 10^{-34}$ Js, $e = 1.602 \times 10^{-19}$ C
  $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}, $1/4\pi\varepsilon_o = 9 \times 10^9$ Nm^2 C^{-2}

Set-1

Time: Three Hours **Max. Marks: 70**

1. **Name the characteristics of electromagnetic waves that (i) increases (ii) remains constant. In the electromagnetic spectrum as one moves from radio wave region towards ultraviolet region.**

2. **State and explain the conditions for interference of light waves.**
3. **If potential difference applied across a conductor is increased from V to 2V, how the drift velocity of electron change?**
4. **How deep will a 4m deep tank appear when seen in air due to optical illusion? Refractive index of water is 4/3.**
5. **What type of lens is an air bubble inside water?**
6. **Define the term activity of a radioactive substance. State its SI units.**
7. **An electron is moving along negative X-axis in the presence of uniform magnetic field along positive Y-axis. What is the direction of force acting on it?**
8. **What is de-Broglie wavelength of an atom at absolute temperature TK?**
9. **Draw block diagram of a simple amplitude modulation, explaining briefly how amplitude modulation is achieved.**
10. **Draw ray diagram and depict the behaviour of magnetic field lines near a bar of:**
    - **i. Copper**
    - **ii. Aluminium**
    - **iii. Mercury cooled to a very low temperature (4.2K).**
11. **Define the term potential barrier and depletion region for a p-n junction diode. 2**
12. **A radioactive material is reduced to 1/16 of its original amount in 4 days. How much material should one begin with so that 4×10^{-3} kg of the material is left after 6 days?**
    Or
    Draw a graph showing the variation of potential energy between a pair of nucleons as a function of their separation. Indicate the regions in which nuclear force is :
    - **(i) Attractive.**
    - **(ii) Repulsive.**
13. **A galvanometer has a resistance 30Ω and gives a full scale deflection for a current of 2mA. How much resistance and in what way must be connect to convert it into:**
    - **i. An ammeter of range 0.3 A.**
    - **ii. A voltmeter of range 0.2 V.**
14. **A uniformly charged conducting sphere of diameter 2.5 m has a surface charge density 100 $\mu C/m^2$. Calculate:**
    - **i. Charge on the sphere and**
    - **ii. Total electric flux passing through the sphere.**

15. **What happens to the energy stored in a capacitor if after disconnecting the battery, the plates of a charged capacitor are moved farther?**
16. **Identify the following electromagnetic radiations as per the frequencies given below:**
    (i) 10^{20} Hz (ii) 10^{9} Hz
    Write one application of each.
17. **(a) Draw the block diagram of a communication system.**

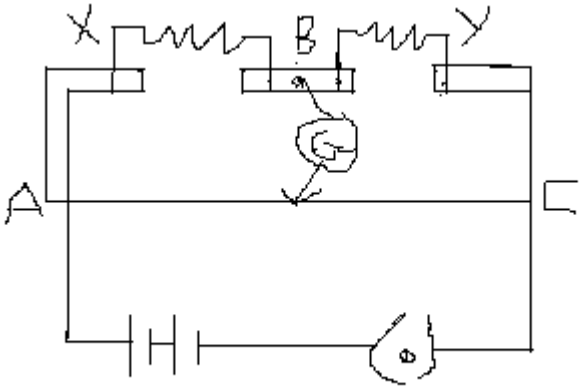
(b) What is meant by detection of a modulated carrier wave? Describe briefly the essential steps for detection.

18. **Deduce the laws of reflection from Huygens wave theory.**
19. **State Kirchhoff's laws for electrical circuits. Use it find the balanced condition of Wheatstone bridge.**

    Or

    (a) Establish a relation between current and drift velocity.

    (b) Write Ohm's law in vector form.
20. **The given figure shows the experimental setup of a metre bridge. The null point is found to be 60 cm away from the end A with X and Y in position as shown. When a resistance of 15 ohms is connected in series with Y, the null point is found to shift by 10 cm towards the end A of the wire. Find the position of null point if a resistance of 30 ohms were connected in parallel with Y.**

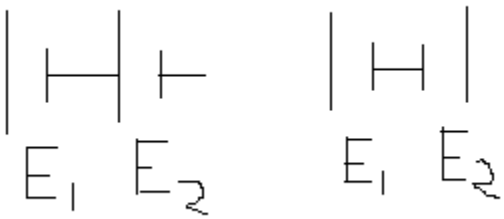


Or

Why is a potentiometer preferred over a voltmeter for determining the emf of a cell?

Two cells of E_1 and E_2 are connected together in two ways shown here.

The balanced points in a given potentiometer experiment for these two combinations of cells are found to be at 351.0 cm and 70.2 cm respectively. Calculate the ratio of the emfs of the two cells.



21. **The work function of a metal is 2.14 eV. When light of frequency 6×10^{14} Hz is incident on the metal surface, photoemission of electrons occurs. What is the :**
    (a) Maximum kinetic energy of the emitted electrons?
    (b) Stopping potential and
    (c) Maximum speed of emitted electrons?
22. **Derive Expression for self inductance of a long air cored solenoid of length l, cross sectional area A and having number of turns N.**
23. **With help of an example, explain how the neutron to proton ratio changes during α-decay of a nucleus.**
24. **At What angle should a ray of light be incident on the face of a prism of refracting angle 60^0 so that it just suffers total internal refraction at the other face? The refracting index of prism is 1.524.**
25. **Distinguish the magnetic properties of dia, para and ferromagnetic substances in term of:**
    i. Susceptibility
    ii. Magnetic permeability
    iii. Coercivity
    Give an example of each of these materials. Draw the field lines due to an external magnetic field near a (a) diamagnetic (b) Paramagnetic substance.

26. **Raman's Father bought a new flat in a multistory building. One day he went to visit the building and flat. There, he found that there is no provision for preventing the damage caused by lighting. He told about it to his father. They meet to the secretary of the building society and explained them about lightning strike. Raman told them the method to protect building from lightning.**
    (a) What values were displayed by Raman?
    (b) Explain the method to protect building from lightning.
27. **With the help of a circuit diagram, explain how an n-p-n transistor can be used to produce self sustained oscillation in an oscillator. 5**
    Or
    A student has to study the input and output characteristics of a n-p-n silicon transistor in the Common Emitter configuration. What kind of a circuit

arrangement should she use for this purpose? Draw the typical shape of input characteristics likely to be obtained by her. What do we understand by the cut off, active and saturation states of the transistor? In which of these states does the transistor not remain when being used as a switch?

28. Define mutual inductance and give its SI unit. Derive expression for the mutual inductance of two long coaxial solenoids of same length wound over the other. 5

Or

(a) A rectangular coil of N-turns, area A is held in a uniform magnetic field B. If the coil is rotated at a steady angular speed ω deduce an expression for the induced emf in the coil at any instant of time.

(b) Explain how does the emf vary when the coil turns through an angle of 2Π? What is the instantaneous value of induced emf when the plane of the coil makes an angle of 60^o with the magnetic lines.

29. Draw a ray diagram for formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2. Hence, derive lens maker's formula for a double convex lens. 5

Or

With help of a ray diagram, show the formation of image of a point object by refraction of light at a spherical surface separating two media of refractive indices μ_1 and μ_2 ($\mu_2 > \mu_1$) respectively. Using this diagram, derive the relation

$$\mu_2/v - \mu_1/u = \mu_2 - \mu_1/R$$

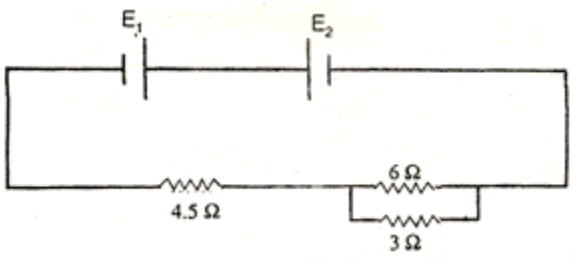
Paper Submitted By:

Servejeet Prasad
Frequency Physics Classes Barh Patna (India)
Mo: 9955429207, 8235119778
Email: servejeet@gmail.com

Set-2

Time: Three Hours **Max. Marks: 70**

1. What is Bohr magnetron?
2. Suggest two methods by which method the range of transmission by a TV tower can be increased.
3. **A carbon resistor of 47 kΩ is to be marked with rings of different colours for its identification. Write the sequence of colours of rings.**
4. **The energy of the hydrogen atom in its ground state is –13.6 eV. Calculate the energy of the atom in the second excited state.**
5. **What is the threshold frequency of a photon for photoelectric emission from a metal of work function 0.1 eV?**
6. **Two lenses of power +4 and –2 dioptres respectively are placed 10 cm apart. What is focal length and power of the combination?**
7. **The magnetic flux threading a coil changes from $12x10^{-3}$ Wb to $6x10^{-3}$ Wb in 0.01 s. Calculate the induced emf.**
8. Two identical loops, one of copper and the other of aluminium are rotated with the same speed in a uniform magnetic field acting normal to the plane of the loops. State the reason , for which of the coils (i) induced emf will be more, (ii) induced current will be more?
9. Calculate the temperature at which the resistance of a conductor becomes 20% more than its resistance at 27^0C. The value of the temperature coefficient of resistance of the conductor is 2×10^{-4}/K.
10. Drive an expression for amplitude modulated wave.
11. **A T.V. tower has a height of 400 m at a given place. Calculate as coverage range, if the radius of the earth is 6400 km.**
12. **Name the reaction which takes place when a slow neutron beam strikes $^{235}_{92}U$ nuclei. Write the nuclear reaction involved.**
13. **Obtain an expression for the effective focal length of two thin lenses placed in contact coaxially with each other.**
14. **A 4μF capacitor is charged by a 200 V supply. The supply is then disconnected and the charged capacitor is connected to another uncharged 2 μF capacitor. How much electrostatic energy of the first capacitor is lost in the process of attaining the steady situation?**
15. **Two cells E_1 and E_2 in the given circuit diagram have an emf of 5 V and 9 V and internal resistance of 0.3Ω and 1.2Ω respectively. Calculate the value of current flowing through the resistance of 3Ω.**



16. **What is a photodiode ? Explain its working principle.**

    Or

    What is solar cell ? Briefly describe the construction and working of a typical p-n junction solar cell.

17. **What do understand by Electromagnetic wave ? How does a charge q oscillating at certain frequency produce electromagnetic wave ? Give its four properties.**
18. **An electric dipole is held in an uniform electric field (i) suitable diagram show that it does not undergo any translatory motion, and (ii) derive an expression for torque acting on it and specify its direction.**
19. **Briefly explain the principle of a capacitor. Derive an expression for the capacitance of a parallel plate capacitor, whose plates are separated by a dielectric medium.**

    Or

    A parallel plate capacitor, each with plate area A and separation d, is charged to a potential difference V. The battery used to charge it is then disconnected. A dielectric slab of thickness d and dielectric constant K is now placed between the plates. What change will take place in:
    (a) charge on the plates
    (b) electric field intensity between the plates
    (c) capacitance of the capacitor.
    Justify your answer in each case.

20. **Define the terms: 'half-life period' and 'decay constant' of a radioactive sample. Derive the relation between these terms.**
21. **Derive the lens formula 1/f = 1/v – 1/u for a concave lens using the necessary ray diagram.**

22. **Using Ampere's circuital law find an expression for the magnetic field at a point on the axis of a long solenoid with closely wound turns.**
23. **State the principle of potentiometer. Draw a circuit diagram used to compare the e.m.f. of two primary cells. Write the formula used. How can the sensitivity of a potentiometer be increased?**
24. **Draw a graph to show the variation of the angle of deviation 'D' with that of the angle of incidence 'i' for a monochromatic ray of light passing through a glass prism of refracting angle 'A'. Hence deduce the relation.**

$$\frac{\sin\left(\frac{Dm + A}{2}\right)}{\sin\frac{A}{2}}$$

25. **(a) Deduce de Broglie wavelength of electron accelerated by a potential of V volt.**
    (c) An electron and a proton have same kinetic energy. Which of the two has larger wavelength and why ?
26. **Shivam's younger brother got a magnetic compass. He was playing with that. He observed that compass always stops in a particular direction. He asked about it to shivam. Shivam explained him the cause of it. So that his brother could be motivated towards science.**
    (i) What are the values imbibed by Shivam's brother ?
    (ii) What explanation was given by Shivam to his brother ? Write any two other properties of magnet.
27. **Explain the term inductive reactance. Show graphically the variation of inductive reactance with frequency of the applied alternating voltage.**
    An ac voltage $V = V_0 \sin\omega t$ is applied across a pure inductor of inductance L. Find an expression for the current i, flowing in the circuit and show mathematically that the current flowing through it lags behind the applied voltage by a phase angle of $\Pi/2$. Also draw (i) phasor diagram (ii) graphs of V and I versus ωt for the circuit.
    Or
    Explain with the help of a labeled diagram, the principle and working of an AC generator ? write the expression for the emf generated in the coil in term of speed of rotation. Can the current produced by an AC generator be measured with a moving coil galvanometer.

28. **What is interference ? Write two essential conditions for sustained interference pattern to be produced on the screen.**

Draw a graph showing the variation of intensity versus the position on the screen in Young's experiment when (a) both the slits are opened, (b) one of the slits is closed. What is the effect on the interference pattern in Young's double slits experiment when:

(i) Screen is moved closer to the plane of slits.
(ii) Separation between two slits is increased.

Explain your answer in each case.

Or

What is diffraction of light ? Draw a graph showing the variation of intensity with angle in a single slit diffraction experiment. Write one feature which distinguishes the observed pattern from the double slit interference pattern. How would the diffraction pattern of a single slit be affected when:

(i) The width of the slit is decreased
(ii) The monochromatic source of light is replaced by a source of white light ?

29. With the help of a labelled circuit diagram, explain how an n-p-n transistor can be used as an amplifier in common-emitter configuration. Explain how the input and output voltages are out of phase by 180^0 for a common-emitter transistor amplifier.

OR

(a) **Explain briefly with the help of circuit diagram, how V - I characteristics of a p-n junction diode are obtained in (i) forward bias, and (ii) reverse bias. Draw the shape of the curves obtained.**
(b) **A semiconductor has equal electron and whole concentration of 6×10^8 /m^3. On doping with certain impurity, electron concentration increases to 9×10^{12} /m^3.**

(i) Identify the new semiconductor obtained after doping.
(ii) Calculate the new hole concentration. 5

Paper Submitted By:

Servejeet Prasad
Frequency Physics Classes Barh Patna (India)
Mo: 9955429207, 8235119778
Email: servejeet@gmail.com