PRE BOARD EXAMINATION (2019-2020)

GRADE:XII.[C.B.S.E] TOTAL MARKS: 70

PHYSICS

DATE: TIME: 3 hours

General Instructions:

1. All questions are compulsory. There are 37 questions in all.

2. This question paper has four sections: Section A, Section B, Section C and Section D.

3. Section A contains twenty questions of one mark each, Section B contains seven questions of two marks each, Section C contains seven questions of three marks each, and Section D contains three questions of five marks each.

4. There is no overall choice. However, internal choices have been provided in two questions of one mark each, two questions of two marks, one question of three marks and threequestions of five marks weightage. You have to attempt only one of the choices in such questions.

5. You may use the following values of physical constants where ever necessary.

$c = 3 \times 10^{8}$ m/s

$h = 6.63 \times 10^{-34}$ Js

$e = 1.6 \times 10^{-19}$ C

$\mu_o = 4\pi \times 10^{-7}$ T m A^{-1}

$\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2 N^{-1} m^{-2}$

$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^{9}$ N m^2 C^{-2}

$m_e = 9.1 \times 10^{-31}$ kg

mass of neutron = 1.675×10^{-27} kg

mass of proton = 1.673×10^{-27} kg

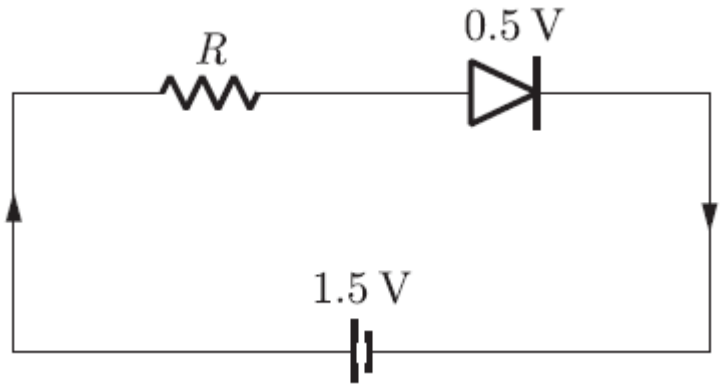
Avogadro's number = 6.023×10^{23} per gram mole

Boltzmann constant = 1.38×10^{-23} JK^{-1}

SECTION :A

Directions (Q1-Q10): Select the most appropriate option from those given below each question

1. The torque acting on electric dipole of dipole moment P placed in electric field of intensity E is, 1
   a. P x E b. P.E c. P/E c. Zero
2. The image formed by objective lens of a compound microscope is, 1
   (a) Virtual and diminished
   (b) Real and diminished
   (c) Real and large
   (d) Virtual and Large
3. Cobalt is 1
   (a) diamagnetic (b) paramagnetic
   (c) ferromagnetic (d) none of these
4. The p n − junction diode used in the circuit shown in the figure has a constant voltage drop at 0.5 V at all currents and a maximum power rating of 100 mW. What should be the value of the resistor R, connected in series and with p n − junction diode for obtaining maximum current? 1



   (a) 5 Ω (b) 10 Ω
   (c) 15 Ω (d) 20 Ω
5. In a circuit with a coil of resistance 2Ω , the magnetic flux changes from 2Wb to 10Wb in 0.2 s. The charge that flows in the coil during this time is **,** 1
   (a) 5C (b) 4 C
   (c) 1C (d) 0.8 C
6. In an oscillating LC-circuit, effective inductance is 200 μ H. If frequency of oscillation is 1200 kHz, then capacitance of capacitor in the circuit is **,** 1
   (a) 11 pF (b) 22 pF
   (c) 44 pF (d) 88 pF
7. The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of 1
   (a) speed of the particle (b) mass of the particle
   (c) charge of the particle (d) magnetic field
8. Photoelectric emission from a given surface of metal can take place when the value of a 'physical quantity' is less than the energy of incident photon. The physical quantity is : 1
   (a) Threshold frequency (b) Work function of surface
   (c) Threshold wave length (d) Stopping Potential
9. Unpolarized light is incident on a plane glass surface having refractive index √3 . The angle of incidence at which reflected and refracted rays would become perpendicular to each other is : 1
   (a) 15° (b) 30° (c) 45° (d) 60°
10. A photon beam of energy 12.1eV is incident on a hydrogen atom. The orbit to which electron of H-atom be excited is 1
    (a) 2nd (b) 3rd (c) 4th (d) 5th

Directions (Q11 –Q15) Fill in the blanks with appropriate answer.

11. Kirchhoff's second law is based on the law of conservation of ---------- 1

OR

Two resistors having value in the ratio 2:1are connected in parallel with a cell. The ratio of power dissipated is ----------.

12. n identical small spherical drops, each of radius r are charged to same potential V . They are combined to form a bigger drop. The potential of the big drop will be 1
13. ---------- is a vacancy created ,when an electron leaves a covalent bond. 1
14. When a β – (minus) particle is emitted from a nucleus, then its neutron -proton ratio ---------- 1
15. Optical denseness of a medium is measured in terms of ----------. 1

Directions (Q16 –Q20) Answer the following

16. A convex lens of refractive index 1.5 is immersed in carbon di sulphide of refractive index 1.6.What happens to the nature of the lens. 1

OR

A concave mirror is held in water. What should be the change in focal length of the mirror?

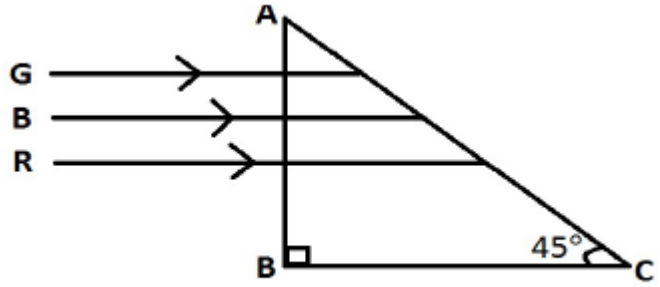
17. A cell of emf E and internal resistance r is connected across a variable resistor R. Plot a graph showing the variation of terminal potential V with resistance R. 1
18. Write any two uses of micro waves. 1
19. The radius of inner most orbit of hydrogen atom is 5.1×10^{-11}m. What is the radius of orbit in second excited state? 1
20. Sketch the shape of the wavefront coming out of a convex lens when a point source of light is placed at its focus. 1

SECTION B

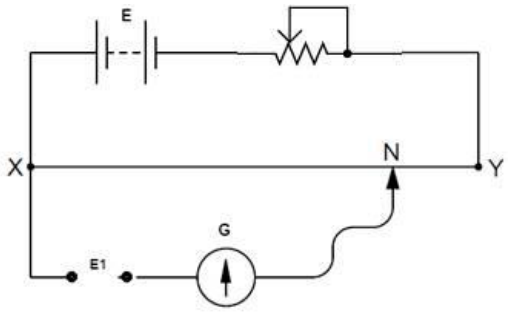
21. An electron and a proton have the same kinetic energy. Which of the two has a greater De-Broglie wavelength? Explain. 2
22. How are electromagnetic waves produced by oscillating charges ? 2
Draw a sketch of linearly polarized em waves propagating in the Z-direction. Indicate the directions of the oscillating electric and magnetic fields.
23. A screen is placed 90 cm from an object. The image is obtained on the screen by a convex lens at two different locations separated by 20 cm. Determine the focal length of lens. 2

OR

Refractive indices of the given prism material for Red, Blue and Green colors are respectively 1.39, 1.48 and 1.42 respectively. Trace the path of rays through the prism.



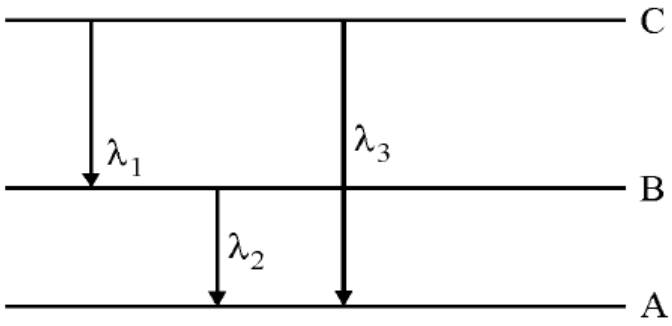
24. Draw the energy band diagram of an intrinsic semiconductor at (a) T= 0K and (b) T > 0K 2
25. State Lenz's law. Does it violates the law of conservation of energy? Justify your answer. 2
26. The diagram below shows a potentiometer set up. On touching the jockey near to the end X of the potentiometer wire, the galvanometer pointer deflects to left. On touching the jockey near to end Y of the potentiometer, the galvanometer pointer again deflects to left but now by a larger amount. Identify the fault in the circuit and explain, using appropriate equations or otherwise, how it leads to such a one-sided deflection. 2



27. Deduce ohm's law using the concept of drift velocity 2

SECTION C

28. (a) State Bohr's quantization condition for defining stationary orbits. How does de Broglie hypothesis explain the stationary orbits ? 3
(b)Find the relation between the three wavelengths λ1, λ2 and λ3 from the energy level diagram shown below.



29. (a)Why is a photodiode operated in the reverse bias mode? 3
(b)State the working of a photodiode with the help of a suitable diagram.
(c)Draw its I-V characteristics for different intensities of illumination.

OR

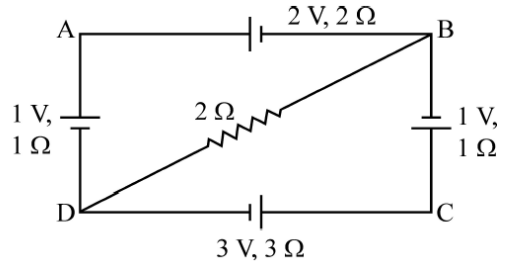
(a)How is a Zener diode fabricated?
(b)What causes the setting up of a high electric field even for small reverse bias voltage across the diode?
(c)With the help of a circuit diagram , explain the working of a Zener diode as a voltage regulator.

30. (a) Draw a graph showing the variation of binding energy per nucleon with mass number. Hence, from the graph, explain why elements having mass number A between 30 and 170 have almost same binding energy. 3
(b)A radio active isotope has half life of 10 years. How long will it take for the activity to reduce to 3.125%.

31. (a)In a single slit diffraction pattern, how does the angular width of central maximum changes when 3
i. Slit width is decreased?
ii. Distance between the slit and screen is increased?
iii. Light of smaller visible wavelength is used? Justify your answer in each case.
(b)The ratio of intensities at minima to the maxima in Young's Double Slit Experiment is 9:25.Find the ratio of the width of the two slits.

32. Using Biot-Savart's law, derive an expression for magnetic field at any point on axial line of a current carrying circular loop. Hence, find magnitude of magnetic field intensity at the centre of circular coil. 3

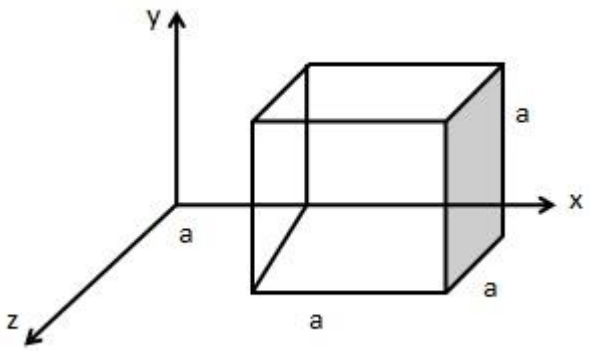
33. Using Kirchhoff's rules, calculate the potential difference between B and D in the circuit diagram as shown in the figure. 3



34. The figure shows a series LCR circuit connected to a variable frequency 200 V source with L = 50 mH, C = 80 μF and R = 40 Ω. 3
Determine
(i) the source frequency which derives the circuit in resonance;
(ii) the quality factor (Q) of the circuit.

SECTION D

35. (a) Using Gauss's law, derive expression for intensity of electric field at any point near the infinitely long straight uniformly charged wire. 5
(b)The electric field components in the following figure are Ex = αx, Ey = 0, Ez= 0; in which α = 400 N/C m. Calculate (i) the electric flux through the cube, and (ii) the charge within the cube assume that a = 0.1m.



OR

(a) Derive an expression for the energy stored in a parallel plate capacitor C, charged to a potential difference V. Hence derive an expression for the energy density of a capacitor.

(b)Find the ratio of the potential differences that must be supplied across the parallel and series combination of two capacitors C1 and C2 with their capacitances in the ratio 1:2 , so that the energy stored in the two cases becomes the same.

36. (a)A series L-C-R circuit is connected to an AC source having voltage V = Vm sinω t . Derive the expression for the instantaneous current I and its phase relationship to the applied voltage. 5
(b)Obtain the condition for resonance to occur.
(c)Define 'power factor'. State the conditions under which it is maximum and minimum.

OR

(a)Derive an expression for the self inductance of a long air –cored solenoid of length l , cross-sectional area A and Number of turns N.
(b) The current flowing through an inductor of self inductance L is continuously increasing. Plot a graph showing the variation of
(i) Magnetic flux versus the current
(ii) Induced emf versus dI/dt
(iii) Magnetic potential energy stored versus the current.

37. a) Draw a ray diagram for final image formed at distance of distinct vision (D) by a compound microscope and write expression for its magnifying power. 5

(b) An angular magnification (magnifying power) of 30x is desired for a compound microscope using as objective of focal length 1.25cm and eye piece of focal length 5cm. How will you set up the compound microscope?

OR

Draw a ray diagram showing the image formation of a distant object by a refracting telescope.
Define magnifying power and write the two important factors considered to increase the magnifying power of a refracting telescope.
Describe briefly the two main limitations and explain how far these can be minimized in a reflecting telescope.
