INDIAN SCHOOL SOHAR
TERM-I EXAMINATION 2019-20
PHYSICS

No. of printed pages: 6

CLASS: XII
DATE : 11/11/2019

Max Marks: 70
Duration : 3 Hours

General Instructions:

(i) All questions are compulsory. There are 37 questions in all.

(ii) This question paper has four sections: Section A, Section B, Section C and Section D.

(iii) Section A contains 20 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 two questions of five marks each.

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

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

$c = 3 \times 10^8$ m/s
$h = 6.6 \times 10^{-34}$ J s
$e = 1.6 \times 10^{-19}$ C
$\mu_0 = 4\pi \times 10^{-7}$ Tm A^{-1}
$\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2}
$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \, Nm^2C^{-2}$
Mass of electron = 9.1×10^{-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

1. Time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of

(a) speed of the particle (b) mass of the particle
(c) charge of the particle (d) magnetic field.

OR

Two wires of same length are shaped into a square and a circle if they carry same current, ratio of magnetic moment is :

(a) 2 : π (b) π : 2
(c) π : 4 (d) 4 : π

2. The final image formed in an astronomical refracting telescope with respect to the object is

   (a) Real inverted (b) Real erect

   (c) Virtual erect (d) Virtual inverted.

3. To study structure of crystals, EM waves used is.

   (a) UV rays (b) X-rays

   (c) γ (Gamma)- rays (d) IR –rays

4. An object approaches a convergent lens from the left of the lens with a uniform speed 5 m/s and stops at the focus. The image

   (a) moves away from the lens with an uniform speed 5 m/s.

   (b) moves away from the lens with an uniform acceleration.

   (c) moves away from the lens with a non-uniform acceleration.

   (d) moves towards the lens with a non-uniform acceleration.

5. If λx , λm , λv represents wavelength of X-Rays, microwaves & visible rays then

   (a) $\lambda m > \lambda x > \lambda v$ (b) $\lambda m > \lambda v > \lambda x$

   (c) $\lambda v > \lambda x > \lambda m$ (d) $\lambda v > \lambda m > \lambda x$

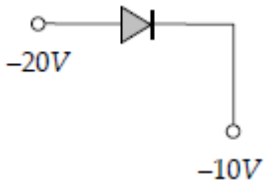
6. Diffraction effects show that light does not travel straight lines. Under what condition the concepts of ray optics are valid. (where D is the distance of screen from the slit, Z_f – Fresnel distance).

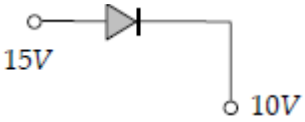
   (a) $D = Z_f$ (b) $D < Z_f$

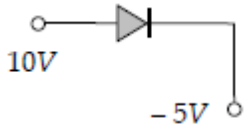
   (c) $D > Z_f$ (d) $D << Z_f$

7. Which is reverse biased diode

   (a) 

   (b) 

   (c) 

   (d) 

8. If a full wave rectifier circuit is operating from 50 *Hz* mains, the fundamental frequency in the ripple will be

   (a) 50 *Hz* (b) 70.7 *Hz*

   (c) 100 *Hz* (d) 25 *Hz*

9. A dipole is placed parallel to electric field. If W is the work done in rotating the dipole from 0° to 60°, then work done in rotating it from 0° to 180° is

   (a) 2 W (b) 3 W

   (c) 4 W (d) 2 W

10. The shape of the interference fringes in Young's double slit experiment when D (distance between slit and screen) is very large as compared to fringe width is nearly

    (a) straight line (b) parabolic

    (c) circular (d) hyperbolic.

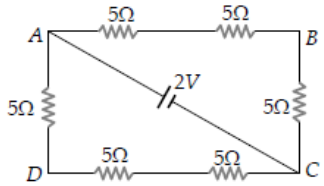
11. Horizontal and vertical components of earth's magnetic field at a place are equal. The angle of dip at that place is _____.

OR

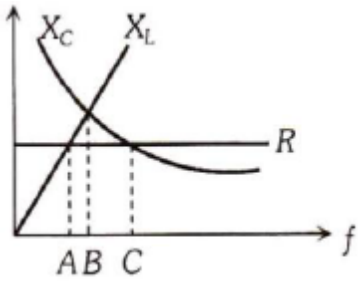
A free floating magnetic needle at North pole is _____to the surface of earth.

12. The magnetic flux linked with a coil changes by 2×10^{-2}Wb when the current changes by 0.01 A. The self inductance of the coil is_____.
13. If the angular speed of the armature of a dynamo is doubled then the amplitude of the induced e.m.f will become_____.
14. An equilateral prism is made up of material of refractive index √3 . The angle of minimum deviation of light passing through the prism is_____.
15. Two equal and opposite charges of magnitude 0.2μC are 15 cm apart, the magnitude and direction of the resultant electric intensity E at a point midway between the charge is _____
16. An unpolarized light is incident on a plane glass surface having refractive index √3. What is the angle of incidence at which reflected and refracted rays would become perpendicular to each other ?

17. What will be the potential difference between points A and B of adjoining figure is

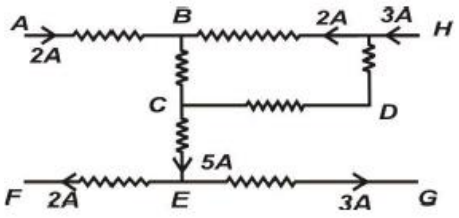


18. The figure shows variation of R, X_L and X_C with frequency f in a series LCR circuit. Then for what frequency point, the circuit is inductive. Why?



19. Find the ratio of voltage sensitivity and current sensitivity of a moving coil galvanometer.

20. In the circuit diagram given, determine the electric current through branch BC.



Section B

21. (a)How many electrons must be added to one plate and removed from the other so as to store 25.0 J of energy in a 5.0 nF parallel plate capacitor?
    (b) How would you modify this capacitor so that it can store 50.0 J of energy without changing the charge on its plates?
22. Show that two parallel long straight current carrying conductors in opposite direction would repel each other.
23. Draw a plot showing the variation of intensity of magnetisation with the applied magnetic field intensity for Bismuth. Under what condition does the magnetic material exhibit perfect conductivity and perfect diamagnetism ?
24. Obtain a relationship between the charge flowing through the circuit and the change in magnetic flux.
25. Show that the magnetic field B at a point in between the plates of a parallel-plate capacitor during charging is $\frac{r\varepsilon_0\mu_0}{2}\frac{dE}{dt}$.

OR

A plane EM wave travelling in vacuum along z direction is given by **E** = E_0 sin($k\,z - \omega t$) **i** and **B** = B_0 sin ($k\,z - \omega t$) **j** . Draw the wave pattern of this em wave.

26. A 10 V Zener diode along with a series resistance is connected across a 40 V supply. Calculate the minimum value of the resistance required, if the maximum Zener current is 50 mA.

OR

Why Si and GaAs are preferred materials for solar cells?

27. The focal length of a convex lens made of glass is 20 cm. What will be its new focal length when placed in a medium of refractive index 1.25?

Section C

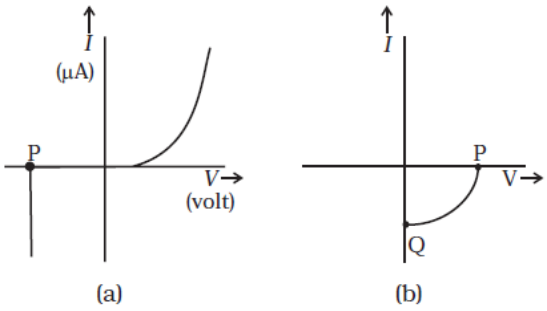
28. Derive mirror equation for a convex mirror. Using it, show that a convex mirror always produces a virtual image, independent of the location of object.
29. A parallel plate capacitor is maintained at certain potential difference. When a 3 mm slab is introduced between the plates , in order to maintain the same potential difference, the distance between the plates is increased by 2.4 mm. Find the dielectric constant of the slab.
30. The ratios of number of density of free electrons to holes , $\frac{n_e}{n_h}$, for two different materials A and B are equal to one and less than one respectively. Name the type of semiconductor to which A and B belong. Draw energy level diagrams for A and B.

OR

(i) Name the type of a diode whose characteristics are shown in Fig (a) and Fig (b).

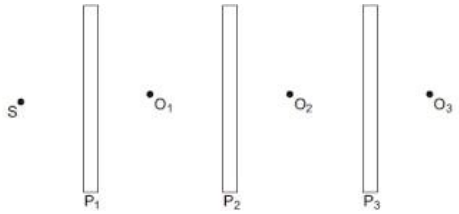
(ii) What does the point P in Fig (a) represent?

(iii) What do the points P and Q in Fig (b) represent?

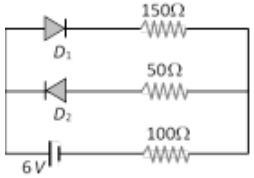


(a) (b)

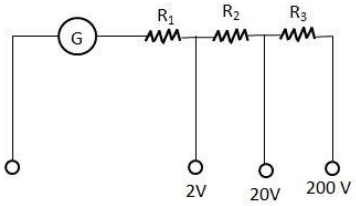
31. Three identical polaroid sheets P_1, P_2, and P_3 are oriented so that the pass axis of P_2 and P_3 are identical at angles of 60^0 and 90^0 , respectively , with respect to the pass axis of P_1. A monochromatic source, S of intensity $\mathbf{I_0}$, is kept in front of the polaroid sheet P_1. Find the intensity of this light , as observed by O_1 , O_2 and O_3 positioned as shown in figure.



32. The circuit shown in figure contains two diodes D_1 and D_2 , each with a forward resistance of 50 ohm and with infinite backward resistance. If the battery voltage is 6 V, find current through the 100 ohm resistance.



33. A multirange voltmeter can be constructed by using a galvanometer circuit as shown in the figure. We want to construct a voltmeter that can measure 2 V, 20 V and 200 V using a galvanometer of resistance 10 Ω and that produces maximum deflection for current of 1 mA. Find the value of R_1, R_2 and R_3 that have to be used.



34. Obtain the resonant frequency and Q – factor of a series LCR circuit with L = 3H, C = 27μF, R =7.4Ω. It is desired to improve the sharpness of resonance of circuit by reducing its full width at half maximum by a factor of 2. Suggest a suitable way.

Section D

35. (i) Draw a labelled diagram of a full wave rectifier circuit. Explain its working, showing the input and output waveforms.

(ii) State reason why a capacitor of large capacitance is connected across the load resistor in the rectifier output. **OR**

(a) Distinguish between an intrinsic semiconductor and a p-type semiconductor . Give reason why a p- type semiconductor is electrically neutral, although $n_h >> n_e$.

(b) Explain , how the heavy doping of both p – and n – sides of a p – n junction diode results in the electric field of the junction being extremely high even with a reverse bias of a few volts. Explain, with the help of a circuit diagram, how this property is used in voltage regulator.

36. State the principle which helps us to determine the shape of the wavefront at a later time from its given shape at any time. Apply this principle to
    a. Show that a spherical/plane wavefront continues to propagate forward as aspherical/ plane wavefront.
    b. (ii) Derive Snell's law of refraction by drawing the refracted wavefront corresponding to as plane wavefront incident on the boundary separating a rarer medium from a denser medium.

OR

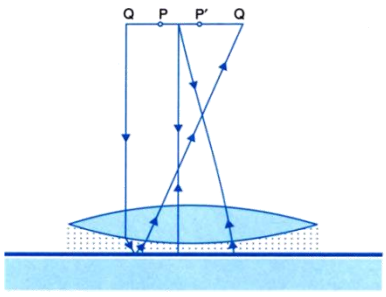
(a) Define resolving power of a compound microscope. Obtain the expression for the resolving power of a compound microscope.

(ii) calculate the limit of resolution of a 100 cm telescope with visible light of wavelength 5500 A^0.

37. (a) With the help of a labelled diagram, show the image formation by a compound microscope when the final image is formed at infinity.

(b) Figure 9.37 shows an equiconvex lens (of refractive index 1.50) in contact with a liquid layer on top of a plane mirror. A small needle with its tip on the principal axis is moved along the axis until its inverted image is found at the position of the needle. The distance of the needle from the lens is measured to be 45.0cm. The liquid is removed and the experiment is repeated. The new distance is measured to be 30.0cm. What is the refractive index of the liquid?

OR



    a. A point object 'O' is kept in a medium of refractive index n_1 in front of a convex spherical surface of radius of curvature R which separates the second medium of refractive index n_2 from the first one. Draw the ray diagram showing the image formation and deduce the relationship between the object distance and the image distance in terms of n_1, n_2 and R.
    b. Obtain the expression for the lens maker's formula.