**No. of printed pages:4**

**INDIAN SCHOOL SOHAR**
**SECOND TERM EXAM- 2015**
**PHYSICS – THEORY**

**CLASS: XII** **MARKS:70**
**DATE: 29 /11/2015** **TIME:3hrs**

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**General Instructions:**

**1. All questions are compulsory**.

**2. There are 26 questions in all .Questions 1 to 5 carry one mark each, questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each. Question 23 is a value based question carrying four marks and questions 24 to 26 carry five marks each.**

**3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.**

**4. You have to attempt only one of the given choices in such questions.**

**5. Use of calculator is not permitted.**

**6. You may use the following physical constants wherever necessary**

***C= 3X $10^8$ m/s*** ***h= 6.626 X$10^{-34}$ Js*** ***e=1.6X $10^{-19}$ c***

$\frac{1}{4\pi\varepsilon_O}$ ***=9 X $10^9$ $Nm^2/c^2$.*** ***$\mu o=4\pi$ X $10^{-7}$ T m $A^{-1}$ .*** ***$N_A$= 6.023 X$10^{23}$/mol***

***Mass of proton=1.676 X $10^{-27}$ kg.*** ***Mass of neutron=1.675 X $10^{-27}$ kg.***

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## SECTION-A

1. Two wires of equal lengths are bent in the form of two loops. One of loops is a square shaped whereas other is circular. These are suspended in a uniform magnetic field and same current is passed through them. Which will experience greater torque? Why?

2. How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced with red light?

3. The instantaneous current and voltage of an a.c. circuit are given by
$i$ = 10 sin 300 $t$ A and
$V$ = 200 sin 300 $t$ V.
What is the power dissipation in the circuit?

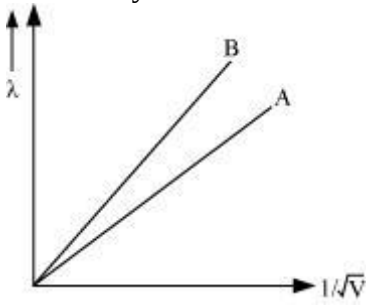
4. Why should the spring/suspension wire in a moving coil galvanometer have low torsional constant?

5. Why does the bluish colour predominate in a clear sky?

## SECTION-B

6.Two lines, *A* and *B*, in the plot given below show the variation of de Broglie wavelength, λ versus $\frac{1}{\sqrt{V}}$ , where $V$ is the accelerating potential difference, for two

particles carrying the same charge.Which one of two represents a particle of smaller mass?Why?



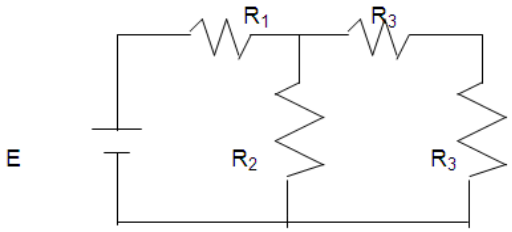

7.Draw a labelled ray diagram of an astronomical telescope in the near point position. Derive the expression for its magnifying power.

9.Using Ampere's circuital law, obtain an expression for the magnetic field along the axis of a current carrying solenoid of length *l* and having *N* number of turns.

OR

9. Using the Ampere's circuital law,obtain an expression for magnetic field in a toroid.

10. Determine the voltage drop and hence power dissipated across the resistance $R_2$ in the circuit given with E = 65 V. $R_1$ = 50 ohms, $R_2$ = 100 ohms, R4=100 ohms, $R_4$ = 300 ohms.




## SECTION-C

11.State one feature by which the phenomenon of interference can be distinguished from that of diffraction.

A parallel beam of light of wavelength 600 nm is incident normally on a slit of width '*a*'. If the distance between the slits and the screen is 0.8 m and the distance of $2^{nd}$ order maximum from the centre of the screen is 15 mm, calculate the width of the slit.

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12. The following table gives the wavelength range of some constituents of the electromagnetic spectrum. Select the wavelength range, and name the associated electromagnetic waves, that are used in (i) radar systems for aircraft navigation.(ii) earth satellites to observe growth of crops.

| S.No. | Wavelength Range |
|---|---|
| 1. | 1mm to 700nm |
| 2. | 0.1m to 1mm |
| 3. | 400 nm to 1nm |
| 4. | $< 10^{-3}$ nm |

13. Derive an expression for the electric potential due to electric dipole at the equator.

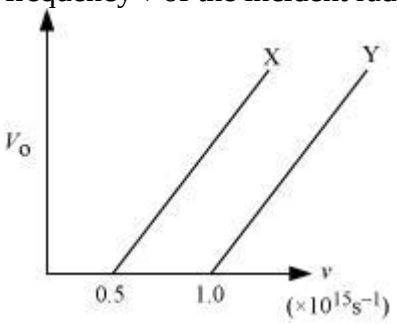
14. .(a) Explain the formation of Brewster's angle with the help diagram.
(b) Between two polaroids placed in the crossed position a third polaroid is introduced. The axis of the third polaroid makes an angle of $30^0$ with the axis of the first polaroid. Find intensity of transmitted light from the system assuming $I_0$ to be the intensity of polarized light obtained from the first Polaroid

15.Draw the labelled circuit diagram of a common-emitter transistor amplifier. Explain clearly how the input and output signals are in opposite phase.

**OR**

State briefly the underlying principle of a transistor oscillator. Draw a circuit diagram showing how the feedback is accomplished by inductive coupling. Explain the oscillator action.

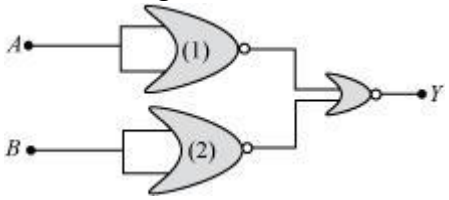
16.The following graph shows the variation of stopping potential $V_0$ with the frequency ν of the incident radiation for two photosensitive metals X and Y:




(i) Which of the metals has larger threshold wavelength? Give reason.
(ii) Explain giving reason, which metal gives out electrons, having larger kinetic energy, for the same wavelength of the incident radiation.
(iii) If the distance between the light source and metal X is halved, how will the kinetic energy of electrons emitted from it change? Give reason

17.A circular coil of 200 turns and radius 10 cm is placed in a uniform magnetic field of 0.5 T, normal to the plane of the coil. If the current in the coil is 3.0 A, calculate the
(a) Total torque on the coil
(b) Total force on the coil
(c) Average force on each electron in the coil due to the magnetic field
Assume the area of cross-section of the wire to be $10^{-5}$ $m^2$ and the free electron density is $10^{29}/m^3$.

18.The inputs *A* and *B* are inverted by using two NOT gates and their outputs are fed to the NOR gate as shown below.




Analyze the action of the gates (1) and (2) and identify the logic gate of the complete circuit so obtained. Give its symbol and the truth table.

19.A long straight wire of a circular cross-section of radius 'a' carries a steady current 'I'. The current is uniformly distributed across the cross-section. Apply Ampere's

circuital law to calculate the magnetic field at a point 'r' in the region for (i) r <a and (ii) r > a.

20.(a) Plot a graph comparing the variation of potential V and electric field E due to a point charge Q as a function of distance R from the point charge.
(b) Find the ratio of the potential differences that must be applied across the parallel and the series combination of capacitors C1 and C2 with their capacitances in the ratio 1:2, so that energy stored in the two cases,becomes the same.

21.Draw the graphs showing the variation of photoelectric current with anode potential of a photocell for (a) the same frequencies but different intensities $I_1 > I_2 > I_3$ of the incident radiation,(b) the same intensity but different frequencies $\upsilon_1 > \upsilon_2 > \upsilon_3$ of the incident radiation. Explain why the saturation current is independent of the anode potential.

22.An inductor 200 mH, a capacitor 500 μF and a resistor 10 Ω are connected in series with a 100 V variable frequency a.c. source. Calculate the
(i) frequency at which the power factor of the circuit is unity.
(ii) current amplitude at this frequency.
(iii) Q-factor.

## SECTION-D

23. When Puja, a student of class X, watched her mother washing clothes in open,she observed coloured soap bubbles and was curious to know why the soap bubbles appeared coloured. In the evening when her father came she asked him this question. Her father explained her the phenomenon.
(i) What according to you are the values displayed by Puja and her father?
(ii) State the phenomenon of light involved in the formation of coloured soap bubbles.

## SECTION-E

24. Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons. Explain with the help of graph the variation of a metal and a semi conductor with temperature.

**OR**

24.A number of identical cells, *n*, each of emf *E*, internal resistance *r* connected in series are charged by a d.c. source of emf *E′*, using a resistor *R*.
(i) Draw the circuit arrangement.
(ii) Deduce the expressions for (a) the changing current and (b) the potential difference across the combination of the cells. (5)

25.Derive the lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ for a concave lens, using the necessary ray diagram.
Two lenses of powers 10 D and − 5 D are placed in contact.
(i) Calculate the power of the new lens.
(ii) Where should an object be held from the lens, so as to obtain a virtual image of magnification 2?

**OR**

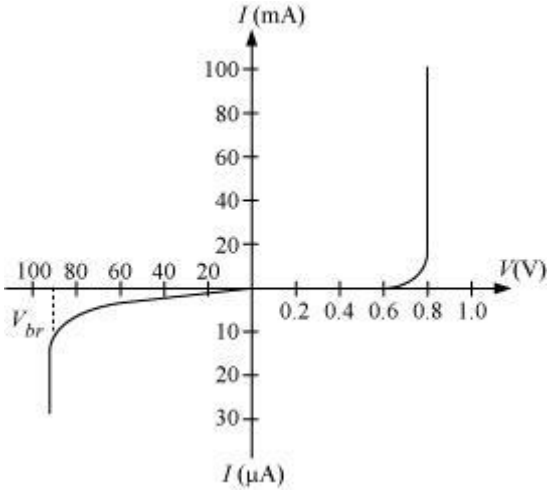
(a) What are coherent sources of light? Two slits in Young's double slit experiment are illuminated by two different sodium lamps emitting light of the same wavelength. Why is no interference pattern observed?

(b) Obtain the condition for getting dark and bright fringes in Young's experiment. Hence derive the expression for the fringe width.

26. Derive the expression for force per unit length between two long straight parallel current carrying conductors. Hence define one ampere.
Define the term 'resolving power' of an astronomical telescope. How does it get affected on
(i) Increasing the aperture of the objective lens?
(ii) Increasing the wavelength of the light used?
Justify your answer in each case.

**OR**

Explain the principle and working of a cyclotron with the help of a schematic diagram. Write the expression for cyclotron frequency
The figure below shows the *V-I* characteristic of a semiconductor diode.




(i) Identify the semiconductor diode used..
(iii) Briefly explain how this diode can be used as a voltage regulator.