Mock Test (2014-2015)
Subject : Physics
Class : XII

Time : 3 Hrs. **M.M. 70**

General Instructions:

(i) All the questions are compulsory.
(ii) Question numbers 1 to 5 are very short answer questions carrying 1 mark each.
(iii) Question numbers 6 to 10 are short answer question carrying 2 marks each.
(iv) Question numbers 11 to 22 are also short answer questions carrying 3 marks each
(v) Question number 23 is a value based questions carrying 4 marks.
(vi) Question numbers 24 to 26 are long answer questions carrying 5 marks each.
(vii) Use long tables, if necessary. Use of calculator is not allowed.

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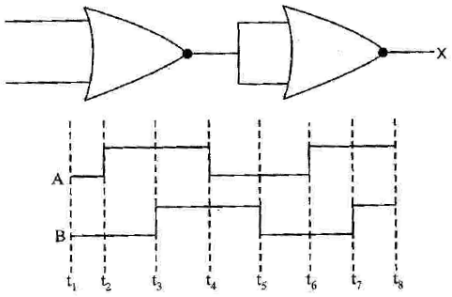
1. The horizontal component of earth magnetic field at a place is B and angle of dip is 60. What is the value of vertical component of earth's magnetic field at equator?
2. A bird siting on a high power line flies away when power is supplied to the line, but a man who touches the same line gets a fatat shock, Why?
3. How would the angular separation of interference fringes in Young's double slit experiment change when the distance between the slits and screen is halved?
4. For the same value of angle of incidence, the angles of refraction in three media A, B and C are $15^0, 25^0$ *and* 35^0 respectively. In which medium would velocity of light be minimum?
5. The output of an OR gate is connected to both of the input of a NAND gate. Write the truth table.
6. Two identical loops, one of copper and the other of aluminum, are rotated with the same angular speed in the same magnetic field Compare:
   (a) The induced e.m.f. and
   (b) The Current produced in the two coils. Justify your answer.
7. State the principle of working of a transformer. Can a transformer be used to step up a DC Voltage? Justify your answer.
8. We know that a plane and a convex mirror produce virtual image of an object. Can they produce real image under some circumstances. Explain
9. A Small telescope has an objective lens of focal length 144 cm and an eye-piece of focal length 6.0 cm, What is the magnifying power of the telescope in normal adjustment? What is the separation between the objective and the eye-piece in this case?

OR

A compound microscope consists of an objective lens of focal length 2.0 cm and an eye-piece of focal length 6.25 cm separated by a distance of 15 cm. How far from the objective should

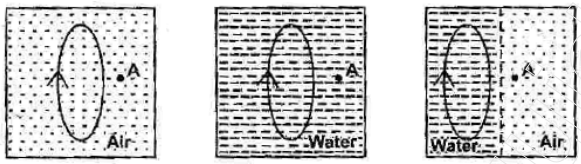
an object be placed in order to obtin the final image at the least distance of distinct vision (25cm.) What is the magnifying power of the microscope in this case?

10. Draw the output waveform at X, using the given inputs A and B for the logic circuit shown below. Also, identify the logic operation performed by this circuit.



11. In the figure shown A is a point in front of a coil. In figure (a) the space all around the coil is filled with air, in figure (b) with water and in figure (c) the space to the left of the boundary is filled with water and that to the right with air. Compare the values of B and H at A in the three cases.

B $\rightarrow$ Megnetic Induction, H $\rightarrow$ Megnetic Intense

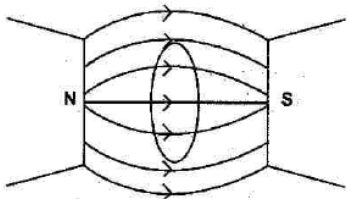


12. Determine the effective focal length of the combination of the two lenses of $f_1 = 30cm \text{ and } f_2 = -20cm.$ If they are placed 8.0cm apart with their principal axis coincident.

Does the answer depend on which side a beam of parallel light is incident?

Is the notion of effective focal length of this system useful at all.

13. If one pole of a powerful magnet is gradually brought towards a similar ple of a weaker magnet, the two repel each other, but when it is quickly brought very close to the weaker pole, the two attract each other. Explain why?
14. A card sheet divided into squares each of size $1mm^2$ is being viewed at a distance of 9 cm through a magnifying glass (a Converging lens of focal length 10 cm) held close to the eye.
    a) What is the magnification produced by lens?
    b) What is the angular magnification (magnifying power) of the lens?
    c) Is the magnification in (a) equal to magnifying power in (b)? Explain
15. A loop shown in figure, is removed from within the space between the poles of an electromagnet.
    a) What is the direction of induced Current?
    b) Is a force required to remove the loop?
    c) Does the total amount of joule heart produced in removing the loop depend on the time taken to remove at?



16. In Young's double slit experiment, derive the condition for (1) Constructive interference and (ii) Destructive interference at a point on the screen.

OR

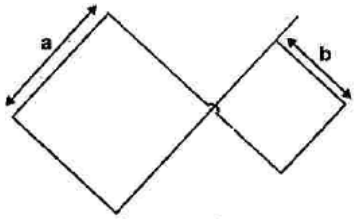
Draw a labelled ray diagram of a compound microscope. Explain briefly its working.

17. Geologists claim that besides the main magnetic N-S poles, there are several local poles on the earth's surface oriented in different directions. How is such a thing possible at all. What is the function of a Geologist.
18. Light from a sodium lamp, is passed through two polaroid sheet P_1 *and* P_2 kept one after the other, keeping P_1 *fixed*, P_2 is rotated about common axis of P_1 *and* P_2. An experimentalist records the following date from the intensity (I) of light coming out of P_2 as a function of angle θ.

Sr. No.		1	2	3	4	5
1.	θ	0°	30°	45°	60°	90°
2.	I (Intensity of light Coming out of P_2	$\frac{I_0}{2}$	$\frac{3I_0}{8}$	$\frac{I_0}{2\sqrt{2}}$	$\frac{I_0}{8}$	0

a) One of these observations if not in agreement with the expected theoretical variation ofI. Identify that observation and write the correct expression.
b) Define Brewster angle and write the expression for it in terms of the refractive index of the medium.

19. A Plane loop, Shaped as two squares of sides a=1 m and b=0.4 cm is introduced into a uniform magnetic field perpendicular to the plane of the loop. The magnetic field varies as $10^{-3}\sin 100t$. Find the amplitude of the current induced in the loop if its resistance per unit length is $r = 5m\,\Omega\,m^{-1}$. The Inductance is negligible.



20. Draw and explain the shape of graph showing the variation of intensity of polarized light transmitted by an analyser. And angle between optic aces of polarizer and analyser.
21. Draw the circuit arrangement needed for studying the input and output characteristic of an $n-p-n$ transistor in its common emitter configuration.

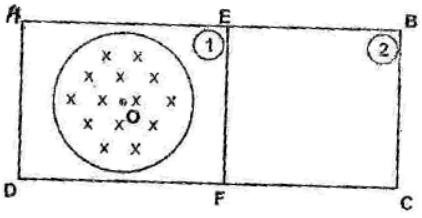
Why is usually enough to determine only one input characteristic?

The Small signal current gain (B_{ac}) of a transistor, can be taken as nearly equal to its DC current amplification factor B_{dc}. Why?

22. An interior decorator want to decorate a room using light of different colours. But his aim is to produce beauty not more brightness or extra electric expense. Suggest a device which can be used at low voltage and from which light of different colour can be obtained. Write the function of that device. What is the main difference between interior decorator and electrician?
23. Rahul after having liver in US for 12 year returned back to India. He had a discussion with his cousin on domestic power supply in US and India. In US power is supplied at 110V, 50 Hz where-as in India it is 220V, 50Hz. Rahul was stressing that US supply is better. Both went to Sumit's father who was an electrical engineer and asked his opinion on the issue. He explained that both the supplies have advantage and disadvantage.
    (i) What values are displayed by Rahul and Sumit.
    (ii) Write one advantage and one disadvantage of 220V Supply over 110 Volt supply.
24.
    a) Of the three vectors in the equation $\vec{F} = q(\vec{V} \times \vec{B})$. Which pairs are always at right angles? Which may have any angle between them?
    b) Two parallel wires carrying current in the same direction attract each other while two beams of electrons travelling in the same direction repel each other. Explain why?
    c) Can a charged particle entering a uniform magnetic field normally from outside complete a circle?

Or

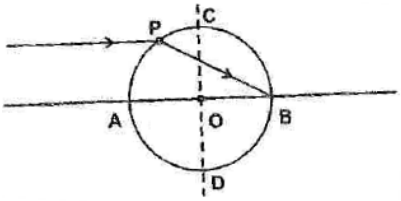
    a) A beam of proton is deflected side-ways. Could this deflection be caused (a) by an electric field? (b) by a magnetic field? (c) if either is possible, how can you tell which one is present?
    b) A magnetic field perpendicular to the plane of rectangular loop of wire is concentrated about O. If the field decreases will there be any e.m.f. produced in loop 1? In loop 2? Explain.
    c) An artificial satellite with a metal surface orbits round the earth. Will the earth's magnetism induceds current in it? Explain.



25. A glass sphere with Centre O is shown in the figure. AOB and COD are two diameters at right angles to each other. A ray parallel to AOB strikes the sphere at P, a point midway between A and C. After refraction, it proceed along PB. Find:
    a) The path of ray beyond B.

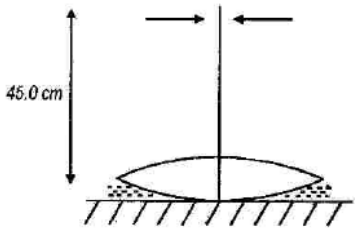
b) The refractive index of glass and

c) The deviation of the ray as it emerges out of the sphere. (sin22.5 =0.3827)



OR

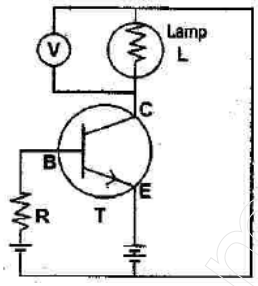
Figure shows an equi-convex lens of refractive index 1.5 in contact with a liquid layer on top of a plane mirror. A small needle with its tip on the principle axis is moved along the axis until its inverted image is found at the position of the needle itself. The distance of the needle form the lens is measured to be 45.0 cm. The liquid is removed and the experiment is repeated. The new distance is measured to be 30.0 cm. What is the refractive index of the liquid?



26.

a) Why is the conductivity of n type semiconductor greater than that of the p-type semiconductor when both of these have same level of doping?

b) In the given circuit, a voltmeter V is connected across lamp L. What changes would you observe in the lamp L and the voltmeter, if the value of resistor R is reduced?



c) Draw a circuit diagram for use of $n-p-n$ transistor as an amplifier in CE-configuration. The input resistance of a transistor is 10000Ω on changing base current by 10μA, the collector current increases by 2 mA, if a load resistance of 5 kΩ is used in the circuit, calculate.

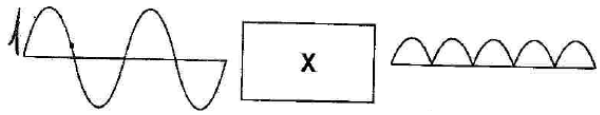
(a) The Current gain

(b) Voltage gain of the amplifier

OR

a) How does the energy gap in an intrinsic semiconductor very, when doped with a pentavalent impurity?

b) In the figure given below the input waveform is converted into output wave form by a device X. Name the device and draw its circuit diagram.



c) A Semiconductor has equal electron and hole concentration of $6\,x\,10^{8}\,m^{-3}$. On doping with a certain impurity, electron, concentration increases to $8\,x\,10^{12}\,m^{-3}$.

(i) Identity the type of new semiconductor

(ii) Calculate the hole concentration in the doped semiconductor.

(iii) How does energy gap very with doping.