PHYSICS

BOOKS - ICSE MODEL PAPER

SAMPLE PAPER 2022

Part I Choose The Correct Alternative

1. Two point charges 17.7 μC and -17.7μC, separated by a very small distance, are kept

inside a large hollow metallic sphere. Electric flux emanating through the sphere is:

A. $2 \times 10^6 \text{Vm}$

B. $-2 \times 10^6 \text{Vm}$

C. Zero

D. $4 \times 10^6 \text{Vm}$

Answer:

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2. Ohm.s law in vector form is :

A. $J = \rho E$

B. $J = \sigma E$

C. $V = IR$

D. $E = \sigma J$

Answer:

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3. If the current (I) flowing through a circular coil, its radius (R) and number of turns (N) in it are each doubled, magnetic flux density at its centre becomes:

A. Two times

B. Four times

C. Eight times

D. Sixteen times

Answer:

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4. A person is suffering from the defect of myopia. His far point will be:

A. Infinity

B. 24 cm

C. $< 25cm$

D. About a metre

Answer:

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5. Ratio of the radius of third Bohr orbit to the radius of second Bohr orbit in hydrogen atom is:

A. $2:3$

B. $4:9$

C. $9:4$

D. $3:2$

Answer:

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Part I Question

1. A dielectric slab of relative premittivity (i.e. dielectric constant) 6 is introduced between the two plates of an 8μF air capacitor, in order to completely occupy the space between the two plates. Find the new capacitance of the capacitor.

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2. Show graphically how resistance of a piece of carbon varies with temperature

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3. Current 'I' flowing through a metallic wire of area of cross-section 'a' is given by the equation $I = \mathrm{naev}_d$. What is the meaning of the symbols 'n' and 'v_d'?

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4. You are provided with four identical cells each of emf 1.5V. How will you connect all of them to obtain a battery of emf 3V?

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5. What is the value of magnetic field around a current carrying torroid?

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6. What type of wave front is associated with a line source of light?

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7. Calculate the polarizing angle for glass whose refractive index is 1.6.

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8. What is the optical power in dioptre of a concave lens of focal length 50 cm?

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9. What is meant by resolving power of a telescope ?

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10. What is the angle made by a refracted ray with the normal inside a regular (equilateral) prism, in minimum deviation case?

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11. Name the series of lines in the hydrogen spectrum which lie in the infrared region.

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12. What are isotones?

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13. Explain the statement: Half-life of polonium is 3.8 days.

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14. In a nuclear reactor, what is the function of graphite rods?

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15. What is amplitude modulation?

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Part Ii Section A

1. Obtain an expression for intensity of electric field in end on position, i.e., axial position of an electric dipole.

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2. Calculate electrostatic potential energy stored in a system consisting of two point charges $100\mu C$ and $40\mu C$ separated by a distance of 9cm, in vacuum.

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3. Two plates of a charged parallel plate capacitor are pulled apart with the help of insulating handles, till their separation is

doubled.

Compare the new electrostatic potential energy of the capacitor with the old

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4. Draw a labelled circuit diagram of a potentiometer to measure internal resistance of a cell. Write the working formula. (Derivation not required).

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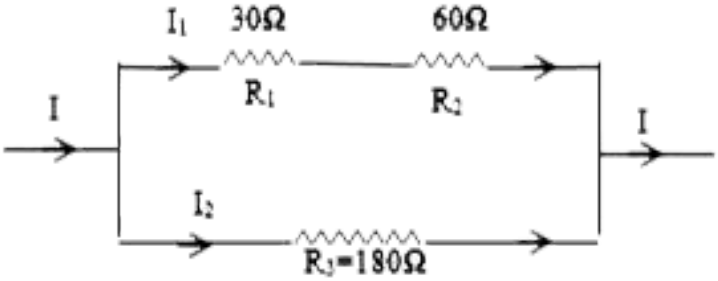
5. In Figure below, power developed in resistor R_1 is 120W. Find the power developed in resistor R_3.



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6. In a metre bridge experiment to determine unknown resistance of a coil, how is position of the null point affected if:

(i) Galvanometer and cell are interchanged?

(ii) Known and unknown resistances are interchanged?

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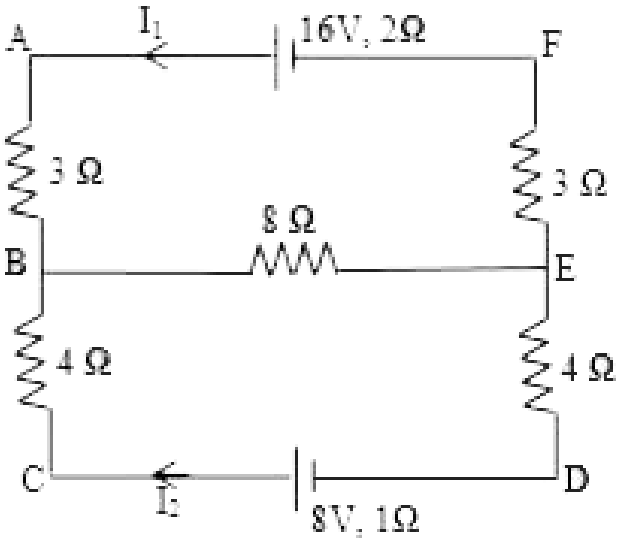
7. Apply Kirchoff's Laws to calculate the currents I_1 and I_2 in the circuit shown in

Figure below:



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8. You are given a bar. How will you identify experimentally whether it is made of a ferro-

magnetic, paramagnetic or a diamagnetic material?

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9. Using Ampere 's circuital law or Biot-Savart's a law, show that magnetic flux density B at point P at a perpendicular distance a from a long current carrying conductor is given by $B = \left(\frac{\mu}{4\pi}\right)\frac{2I}{a}$ [Statement of the laws not required]

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10. Define time constant of an RC circuit. What is its SI unit?

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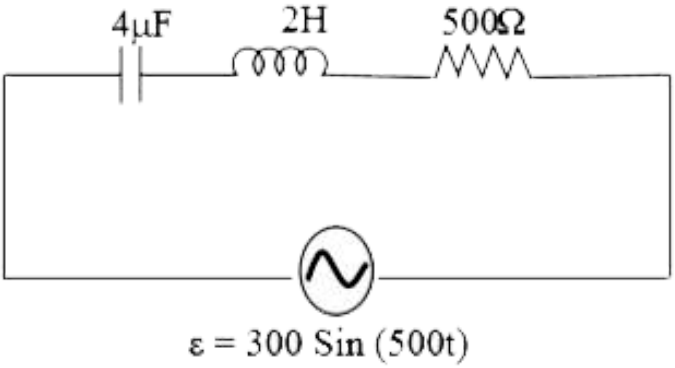
11. (i) In the circuit shown in Figure below, calculate phase difference between the current and the supply voltage:



(ii) State whether current is leading or lagging behind the supply voltage

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12. What is meant by quality factor of an LCR circuit?

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Part Ii Section B

1. Prove the law of reflection of light on the basis of Huygens wave theory of light

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2. Why can't two independent monochromatic sources of light emitting light of one and the same wavelength behave as coherent sources?

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3. In Young's double slit experiment, using light of wavelength 600 nm, 10^{th} bright fringe is obtained on a screen, 3mm from the centre of the pattern. If the screen is 120 cm away from the slits, calculate:

(i) Distance between the two slits,

(ii) Fringe width, i.e. fringe separation.

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4. Show graphically the intensity distribution in Fraunhofer.s single slit diffraction experiment. Label the axes.

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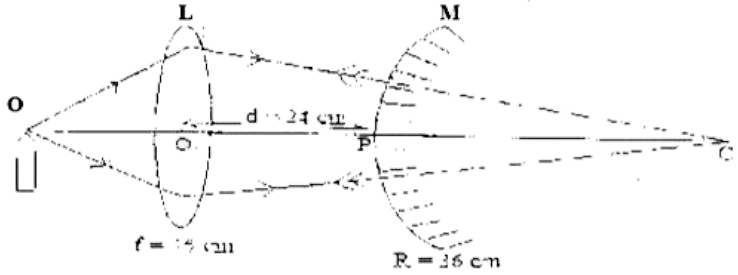
5. An optical system consists of a thin convex lens 'L' of focal length f = 15 cm and a convex mirror M having radius of curvature R=36 cm, arranged co-axially, at a distance of 24 cm. (See Figure below).

Where should an object O be kept so that its inverted image I formed by the lens mirror combination coincides with the object itself?



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6. A narrow and parallel beam of white light is incident on a convex lens, parallel to its principal axis. Draw a labelled diagram to show how coloured images are formed by the lens.

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7. Find the distance between the two lenses of a compound microscope if the final image formed by the microscope is virtual and lies at a distance of 25cm to the left of the eye- piece. Magnifying power of the microscope is 30 and focal lengths of objective and eyepiece are 2cm and 5cm, respectively.

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8. You are provided with two convex lenses having focal lengths 4cm and 80cm, respectively, to form an astronomical telescope.

Calculate its magnifying power for normal adjustment.

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Part Ii Section C

1. (i) Explain the statement: "Work function of a certain metal is 2.0 eV."

(ii) Calculate the maximum wavelength of the electro-magnetic radiation which will cause emission of photoelectrons from this metal.

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2. What is de Broglie hypothesis? What conclusion can be drawn from Davisson and Germer's experiment?

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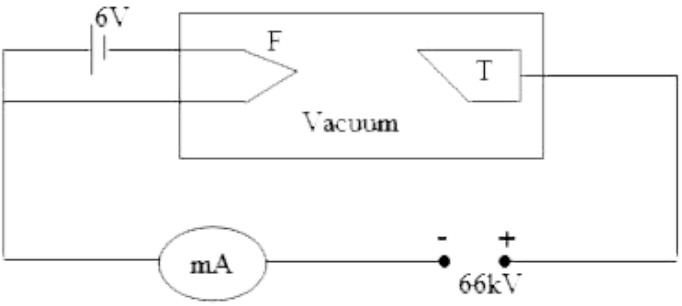
3. Figure below shows a simple diagram of a modern X ray tube. (i.e. Coolidge tube).



(i) Find the minimum wavelength of the X rays emitted by the X ray tube.

(ii) What will be the effect of replacing the 6V battery with a 9V battery on the emitted X rays?

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4. What is meant by mass defect of a nucleus? How is it related to its binding energy?

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5. Starting with the law of radioactive disintegration, show that : $N = N_0 e^{-\lambda t}$, where the terms have their usual meaning.

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6. Calculate the energy released in the following nuclear reaction:

$_1^2H + _1^2H = _2^4He$

Mass of $_1^2H =$ 2.01419u, Mass of $_2^4He = 4.00277u$

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7. Draw a labelled circuit diagram of a transistor as a switch and draw its input and output graphs.

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8. What is the symbol of a NOR gate? Write its truth table.

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