ANGEL'S PUBLIC SCHOOL

Strive for Perfection

SAMPLE PAPER
PRE-BOARD – II   SESSION 2020 – 21
CLASS – XII   SUBJECT : PHYSICS

TIME : 3 HOURS   **M.M = 70**

General Instructions:

(1) All questions are compulsory. There are 33 questions in all.

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

(3) Section A contains ten very short answer questions and four assertion reasoning MCQs of 1 mark each, Section B has two case based questions of 4 marks each, Section C contains nine short answer questions of 2 marks each, Section D contains five short answer questions of 3 marks each and Section E contains three long answer questions of 5 marks each.

(4) There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.

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

$c = 3 \times 10^8 ms^{-1}$

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

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

$\mu_0 = 4\pi \times 10^7 TmA^{-1}$

$\dfrac{1}{4\pi\epsilon_0} = 9 \times 10^9 Nm^2 C^{-2}$
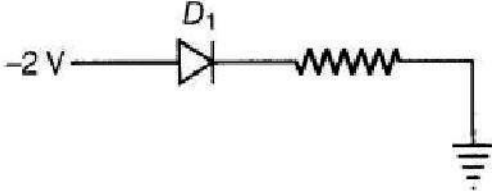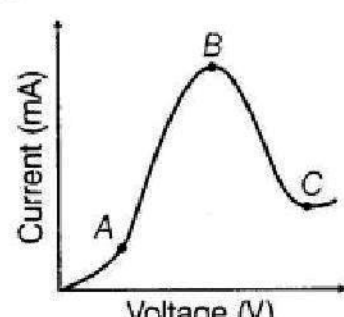
Boltzmann's constant $k = 1.381 \times 10^{-23} JK^{-1}$
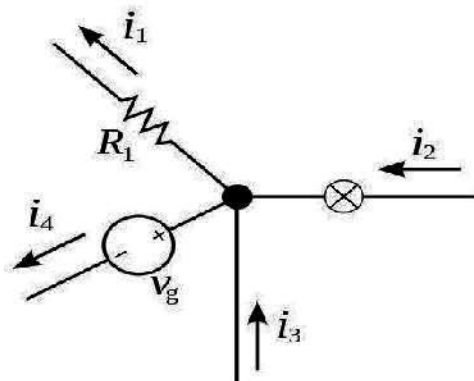
Avogadro's number $N_A = 6.022 \times 10^{23} mole^{-1}$

Mass of neutron $m_n = 1.675 \times 10^{-27} kg$

Mass of electron $m_e = 9.1 \times 10^{-31} kg$
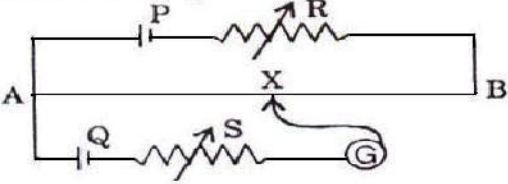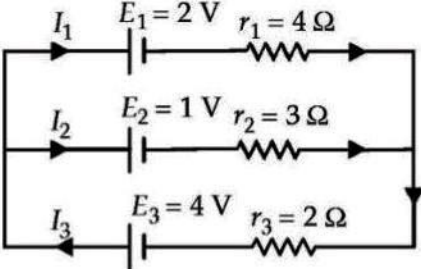
Radius of earth $= 6400\ km$

| S.NO.	QUESTION	MARKS
1	When current changes from + 2 A to – 2 A in 0.05 sec, an emf of 8 V is induced in a coil. The coefficient of self inductance of the coil is? **Or** The current flowing through a pure inductance 2mH is, I =(15 cos 300t) A. What is the (i) rms and average value of current for a complete cycle?	1
2	A point charge of +10μC is at the centre of a cube of side 10cm, what is the magnitude of electric flux through one surface of the cube. **Or** To which part of the electromagnetic spectrum does a wave of frequency 5 x 10^19 Hz belong?	1
3	Magnetic field lines can be entirely confined within the core of a torriod, but not within a straight solenoid. Why?	1

4	What will be the effect on the photoelectric current if we increase the frequency of incident radiation and keep intensity of incident radiation constant?	1
5.	The ground state energy of hydrogen atom is -13.6 eV. What are the kinetic and potential energies of electron in this state?	1
6.	The maximum kinetic energy of a photoelectron is 3 eV. What is its stopping potential?	
7.	Why cannot we take one slab of p-type semiconductor and physically join it to another slab of n-type semiconductor to get p-n junction?	1
8.	What happens to the width of depletion layer of a p-n junction when it is (i)forward biased? (ii)reverse biased? Or The graph shown in the figure represents a plot of current versus voltage for a given semiconductor. Identify the region, if any over which the semiconductor has a negative resistance.	1
9.	Two nuclei have mass numbers in the ratio 3: 2. What is the ratio of their nuclear densities? **Or** Name the absorbing material used to control the reaction rate of neutrons in a nuclear reactor	1
10.	At what temperature would an intrinsic semiconductor behave like a perfect insulator?	1
11.	In the questions (11-14), a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion. (b) If both Assertion and Reason are true, but Reason is not the correct explanation of Assertion. (c) If Assertion is true but Reason is false. (d) If Assertion is false, but Reason is true.	1

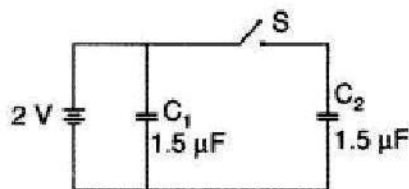|		
	Assertion: Convex mirror is preferred for rearview mirror in vehicles. **Reason:** The field view of a convex mirror is lesser than that of concave mirror.	
12.	**Assertion:** Magnetic field lines do not intersect each other. **Reason:** There cannot be two direction of the magnetic field at a point.	1
13.	**Assertion :** Light shows the phenomena of interference, diffrection and polarisation. **Reason :** Because light behaves as corpuscles.	1
14.	**Assertion:** A current-carrying conductor experiences a force in a magnetic field. **Reason:** on a current-carrying conductor in a magnetic field is due to interaction between magnetic field produced by the current-carrying conductor and external magnetic field in which the conductor is placed.	1
15.	Kirchhoff's circuit laws are two equalities that deal with the current and potential difference in the lumped element model of electrical circuits. They were first described in 1845 by German physicist Gustav Kirchhoff. **Kirchoff' Current Law** This law states that, for any node in an electrical circuit, the sum of currents flowing into that node is equal to the sum of currents flowing out of that node **Kirchoff's Voltage Law** The directed sum of the potential differences (voltages) around any closed loop is zero. 1.Kirchoff current law is conservation of a) Charge b) Energy c) Potential d) Momentum 2.Kirchchoff current law can be written as a) Σ V=0 b) Σ I =0 c) Σ R = 0 d) Σ q = 0 3. Kirchoff's Voltage Law is the conservation of	4

	a) Energy b) Charge c) Current d) Momentum 4. Kirchoff's Voltage Law is applied over a) Closed Circuit loop b) At a circuit node c) Across battery d) None of the above	

16.	As we all know that Sun is the major source of light. Vihaan was walking on road after rain. He sees a pattern of colours in the sky consisting of different colors. He met his friend and talked about it.
	His friend, Also, tells him that the sky appears orange or red during sunset.
	For clarification they ask their physics Teacher next day. Then teacher answers.
	    (1) Name the pattern of seven colours in sky
	    (2) Why sky appears red during sunset?
	    (3) What is dispersion of light.
	    (4) Which colour bends least?
	    (5) What is ray leigh criteria?
		4

17.	Horizontal component of earth's magnetic field at a place is $1/\sqrt{3}$ times the vertical component. What is the value of angle of dip at this place ?	2
18.	A conductor of length l' is connected to a d.c. source of potential V' . If the length of the conductor is doubled by gradually stretching it, keeping 'V ' constant, how will (i) drift speed of electrons and (ii) resistance of the conductor be affected ? Justify your answer	2
19.	A metal plate is introduced between the plates of a charged parallel plate capacitor. What is the effect on the capacitance of the capacitor ? **Or** What do you mean by an electric dipole and electric dipole moment ? Derive an expression for electric field intensity on the equatorial line of an electric dipole.	2
20	What is p-n junction ? Explain briefly, with the help of suitable diagram, how a p-n junction is formed.	2
21	A straight wire of mass200g and length 1.5m carries a current of 2A It is suspended in mid air by a uniform magnetic field B What is the magnitude of the magnetic field ?	2
22	When a tiny circular obstacle is placed in the path of light from a distance source, a bright spot is seen at the centre of the shadow of the obstacle. Explain, why.	2
23	How would the angular separation of interference fringes in Young's double slit experiment change when the distance between the slits and screen is doubled/ halved ? Or Using Huygens principle prove the refraction of light.	2

24	Explain giving reasons, the basic difference/ underlying principle used, in What converting a galvanometer into- (i) an ammeter, and (ii) a Voltmeter	2
	Or	
	Derive the expression of equivalent emf of two cells (e1, r1) and (e2, r2) connected in parallel. Where e is emf and r is internal resistance of the cells.	
25	A thin converging lens has focal length (f) when illuminated by violet light. State with	2
	reason how the focal length of the lens will change if violet light is replaced by red light.	
26	The motion of a copper plate is damped when it is allowed to oscillate between the two poles of a magnet. What is the cause of this damping ?	3
27	In the potentiometer circuit shown, the balance point is at X. State with reason, where the balance point will be shifted when (i) R is increased, (ii) S is increased, keeping R constant. (iii) Cell P is replaced by another cell whose emf is lower than that of cell Q. **OR** State Kirchhoff's rules. Use these rules to write the expressions for the currents I_1 , I_2 and I_3 in the circuit diagram shown.	3
28	The ground state energy of hydrogen atom is – 13.6 eV. What are the kinetic and potential energies of electron in this state?	3
	Or	
	Write the expression for Bohr's radius in hydrogen atom.	
29	Define current sensitivity and voltage sensitivity of galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer, justify your answer.	3
30	Why is the classical (Rutherford) model for an atom of electron orbiting around the nucleus not able to explain the atomic Structure?	3
31	Two dielectric slabs of dielectric constant $K_1 and K_2$ are filled in between the two plates, each of area A, of the parallel plate capacitor as shown in the figure.Find the net capacitance of the capacitor? Area of each plate $= \dfrac{A}{2}$	5

Area = A
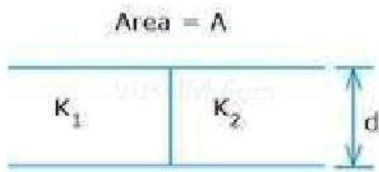
Or

Figure shows two identical capacitors C^1 and C^2 each of 1.5 µF capacitance, connected to a battery of 2 V. Initially switch 'S' is closed. After sometime 'S' is left open and dielectric slabs of dielectric constant K = 2 are inserted to fill completely the space between the plates of the two capacitors. How will the
(i) charge and
(ii) potential difference between the plates of the capacitors be affected after the slabs are inserted?

a) Draw a ray diagram to show the working of a compound microscope. Deduce an expression for the total magnification when the final image is formed at the near point.

b) In a compound microscope, an object is placed at a distance of 1.5 cm from the objective of focal length 1.25 cm. If the eyepiece has a focal length of 5 cm and the final image is formed at the near point, estimate the magnifying power of the microscope.

Or

a) Derive the expression of lens maker formula.

b) A convex lens has a focal length of 25cm in air. When it is dipped in a liquid of refractive index 4/3, its focal length is increased to 100cm. Find the refractive index of lens material.

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	(i)	Use the expression for Lorentz force acting on the charge carriers of a conductor to obtain the expression for the induced emf across the conductor of length l ,moving with velocity v ,through a magnetic field B acting perpendicular to its length	3+2
	(ii)	Describe briefly three main useful applications of eddy currents.	
		Or	
		(a) Derive an expression for the impedance of a series LCR circuit connected to an AC supply of variable frequency.	2+2+1
		(b) Plot a graph showing variation of current with the frequency of the applied voltage.	
		(c) Explain briefly how the phenomenon of resonance in the circuit can be used in the tuning mechanism of a radio or a TV set.	

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