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Class: XII SESSION - 2022-2023

SAMPLE QUESTION PAPER (THEORY) FOR PRACTICE

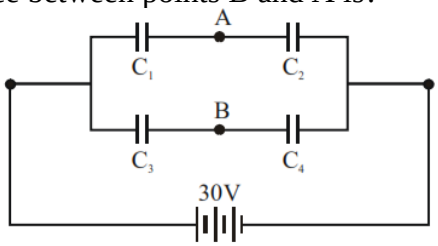
SUBJECT: PHYSICS

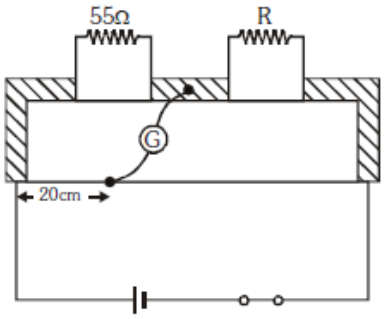
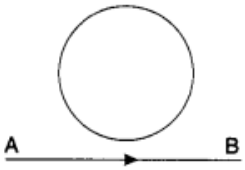
Maximum Marks: 70 Marks **Time Allowed: 3 hours.**

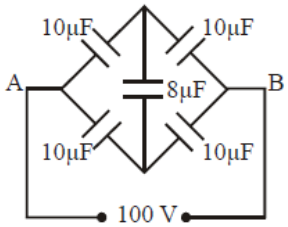
General Instructions:

(1) There are **35 questions** in all. All questions are compulsory
(2) This question paper has five sections: **Section A, Section B, Section C, Section D and Section E**. All the sections are compulsory.
(3) **Section A** contains **eighteen MCQ of 1 mark** each, **Section B** contains **seven questions of two marks** each, **Section C** contains **five questions of three marks** each, **section D** contains **three long questions of five marks** each and **Section E** contains **two case study-based** questions of **4 marks** each.
(4) There is **no overall choice**. However, **an internal choice** has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.
(5) Use of calculators is not allowed.

SECTION A

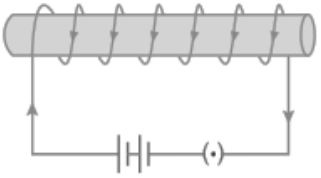
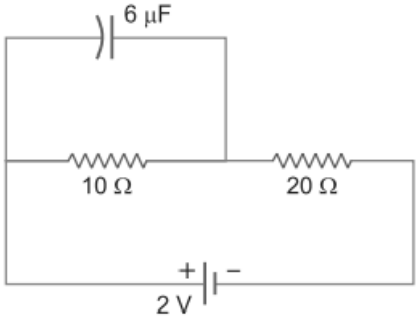
Q. No.		MARKS
1	Force between A and B is F. If 75% charge of A is transferred to B then force between A and B is  (1) $\frac{F}{4}$ (2) 4F (3) F (4) None	1
2	Four capacitors with capacitances C_1= 1μF, C_2 = 1.5 μF, C_3 = 2.5 μF and C_4 = 0.5 μF are connected as shown and are connected to a 30 V source. The potential difference between points B and A is?  (1) 5 V (2) 9 V (3) 10 V (4) 13 V	1
3	Which of the following statements is correct for diamagnetic materials: (1) μ r < 1 (2) χ is negative and low (3) χ does not depend on temperature (4) All of the above	

4	A current of 3 amp is flowing in a plane circular coil of radius 4 cm and number of turns 20. The coil is placed in a uniform magnetic field of magnetic induction 0.5 tesla. Then, the dipole moment of the coil is- (1) 3000 A-m^2 (2) 0.3 A-m^2 (3) 75 A-m^2 (4) 300 A-m^2	1
5	A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field B. The work done to rotate the loop by 30° about an axis perpendicular to its plane is (1) MB (2) $\frac{\sqrt{3}}{2}$MB (3) $\frac{1}{2}$MB (4) zero	1
6	Shown in the figure below is a meter - bridge set up with null deflection in the galvanometer  The value of the unknown resistor R is (1) 13.75 Ω (2) 220 Ω (3) 110 Ω (4) 55 Ω	1
7	In the given figure current from A to B in the straight wire is decreasing. The direction of induced current in the loop is A  (1) clockwise (2) anticlockwise (3) changing (4) nothing can be said	1
8	The nature of electromagnetic wave is- (1) Longitudinal (2) Longitudinal stationary (3) Transverse (4) Transverse stationary	1
9	The work function of Caesium is 2.14 eV. Find the wavelength of the incident light if the photo current is brought to zero by a stopping potential of 0.60 V (1) 454 nm (2) 640 nm (3) 540 nm (4) None of these	1
10	In YDSE the separation between the slits is halved and the distance between slit and the screen is doubled. The fringe width is- (1) unchanged (2) halved (3) doubled (4) four times	1

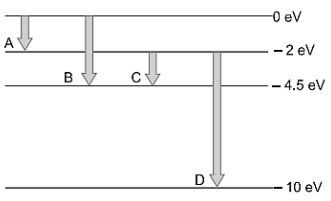
11	When boron $_5B^{10}$ is bombarded by neutron, alpha-particles is emitted. The resulting nucleus has the mass number (1) 11 (2) 7 (3) 6 (4) 15	1
12	A coil of self-inductance L is connected in series with a bulb B and an ac source. Brightness of the bulb decreases when (1) frequency of the ac source is decreased. (2) number of turns in the coil is reduced. (3) a capacitance of reactance Xc = X_L in included. (4) an iron rod is inserted in the coil	1
13	During a mean life of a radioactive element the fraction that disintegrates is: (1) e (2) $\frac{1}{e}$ (3) $\frac{e}{e-1}$ (4) $\frac{e-1}{e}$	1
14	Five capacitors of 10μF capacity each are connected to a DC potential of 100V as shown in the adjoining figure. Find charge in 10μF capacitor- :-  (1) 100 μC (2) 500 μC (3) 250 μC (4) 300 μC	1
15	Two parallel metal plates having charges + Q and – Q face each other at a certain distance between them. If the plates are now dipped in kerosene oil tank, the electric field between the plates will- (1) Increase (2) Decrease (3) Remain same (4) Become zero	1
16	Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (1), (2), (3) and (4) as given below. (1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true and R is NOT the correct explanation of A (3) A is true but R is false (4) A is false and R is also false **Assertion**: Kirchhoff's junction rule follows from conservation of charge. **Reason** : Kirchhoff's loop rule follows from conservation of momentum.	1
17	Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (1), (2), (3) and (4) as given below. (1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true and R is NOT the correct explanation of A (3) A is true but R is false (4) A is false and R is also false **Assertion** In interference, different maxima have same intensities. **Reason** In diffraction phenomenon, different maxima have different intensities.	1

18	Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (1), (2), (3) and (4) as given below. (1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true and R is NOT the correct explanation of A (3) A is true but R is false (4) A is false and R is also false **Assertion** If distance of the point source is increased from the photoelectric plate, then stopping potential will remain unchanged. **Reason** Saturation current will decrease.	1

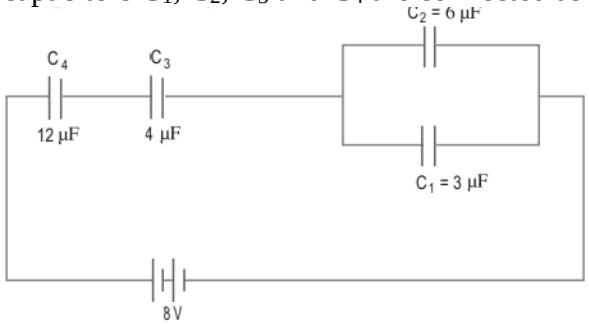
SECTION B

19	Identify the electromagnetic waves whose wavelengths vary as (a) 10^{-12}m < λ < 10^{-8} m (b) 10^{-3} m < λ< 10^{-1} m. Write one use for each.	2
20	Draw the magnetic field lines for a current carrying solenoid when a rod made of (a) copper, (b) aluminium and (c) iron are inserted within the solenoid as  shown.	2
21	Calculate the de-Broglie wavelength of the electron orbiting in the n = 2 state of hydrogen atom. **OR** The kinetic energy of the electron orbiting in the first excited state of hydrogen atom is 3.4 eV. Determine the de Broglie wavelength associated with it.	2
22	What is the focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 20 cm? Is the system a converging or a diverging lens? Ignore thickness of the lenses.	2
23	Draw energy band diagrams of an n-type and p-type semiconductor at temperature T > 0 K. Mark the donor and acceptor energy levels with their energies **OR** How is forward biasing different from reverse biasing in a p-n junction diode?	2
24	Fringe width in a particular YDSE is measured to be b. What will be the fringe width, if wavelength of the light is doubled, separation between the slits is halved and separation between the screen and slits is tripled?	2
25	Find the charge on the capacitor as shown in the circuit.  	2

SECTION C

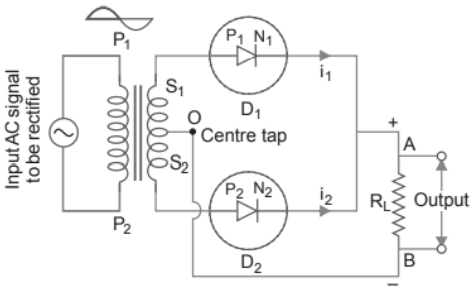
26	The magnitude F of the force between two straight parallel current carrying conductors kept at a distance d apart in air is given by $F = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{d}$ where I_1 and I_2 are the currents flowing through the two wires. Use this expression, and the sign convention that the: "Force of attraction is assigned a negative sign and force of repulsion is assigned a positive sign". Draw graphs showing dependence of F on (i) $I_1 I_2$ when d is kept constant (ii) d when the product $I_1 I_2$ is maintained at a constant positive value. (iii) d when the product $I_1 I_2$ is maintained at a constant negative value.	3
27	A rectangular loop of sides 8 cm × 2 cm with a small cut is stationary in a uniform magnetic field produced by an electromagnet. If the current feeding the electromagnet is gradually reduced so that the magnetic field decreases from its initial value of 0·3 T at the rate of 0·02 Ts–1. If the cut is joined and the loop has a resistance of 1·6 Ω, how much power is dissipated by the loop as heat? What is the source of this power?	3
28	In a series LCR circuit, obtain the conditions under which (i) the impedance of the circuit is minimum, and (ii) wattless current flows in the circuit. **OR** (i) Draw the graphs showing variation of inductive reactance and capacitive reactance with frequency of applied ac source. (ii) Can the voltage drop across the inductor or the capacitor in a series LCR circuit be greater than the applied voltage of the ac source? Justify your answer	3
29	Find the frequency of light which ejects electrons from a metal surface, fully stopped by a retarding potential of 3.3 V. If photoelectric emission begins in this metal at a frequency of $8X10^{14}$ Hz, calculate the work function (in eV) for this metal. OR Light of same wavelength is incident on three photosensitive surfaces A, B and C. The following observations are recorded. (i) From surface A, photoelectrons are not emitted. (ii) From surface B, photoelectrons are just emitted. (iii) From surface C, photoelectrons with some kinetic energies are emitted. Compare the threshold frequencies of the three surfaces and justify your answer.	3
30	The energy levels of a hypothetical atom are shown alongside. Which of the shown transitions will result in the emission of a photon of wavelength 275nm? Which of these transitions correspond to emission of radiation of (i) maximum and (ii) minimum wavelength?  	3

SECTION D

31	(a) An infinitely long positively charged straight wire has a linear charge density λ Cm. An electron is revolving around the wire as its centre with a constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy. (b) Plot a graph of the kinetic energy as a function of charge density λ. OR In a network, four capacitors C_1, C_2, C_3 and C_4 are connected as shown in the fig  (a) Calculate the net capacitance in the circuit. (b) If the charge on the capacitor C_1 is 6 μC (i) calculate the charge on the capacitors C_3 and C_4, and (ii) net energy stored in the capacitors C_3 and C_4 connected in series.	5
32	(i) On the basis of electron drift, derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. On what factors does resistivity of a conductor depend? (ii) Why alloys like constantan and manganin are used for making standard resistors? OR Draw a circuit diagram showing balancing of Wheatstone bridge. Use Kirchhoff's rules to obtain the balance condition in terms of the resistances of four arms of Wheatstone Bridge	5
33	A small candle 2.5 cm in size is placed 27 cm in front of a concave mirror of radius of curvature 36 cm. At what distance from the mirror should a screen be placed in order to receive a sharp image? Describe the nature and size of the image. If the candle is moved closer to the mirror, how should the screen be moved? OR At what angle should a ray of light be incident on the face of a prism of refracting angle 60° so that it just suffers total internal reflection at the other face? The refractive index of prism is 1.524.	5

SECTION E

34	**Case Study: Optical Fibre** **Read the following paragraph and answer the questions.** Optical fibre works on the principle of total internal reflection. Light rays can be used to transmit a huge amount of data, but there is a problem here – the light rays travel in straight lines. So, unless we have a long straight wire without any bends at all, harnessing this advantage will be very tedious. Instead, the optical cables are designed such that they bend all the light rays' inwards (using TIR).	4

	Light rays travel continuously, bouncing off the optical fibre walls and transmitting end to end data. It is usually made of plastic or glass **Modes of transmission**: Single-mode fibre is used for long-distance transmission, while multi-mode fiber is used for shorter distances. The outer cladding of these fibres needs better protection than metal wires. Although light signals do degrade over progressing distances due to absorption and scattering. Then, optical Regenerator system is necessary to boost the signal. **Types of Optical Fibres:** The types of optical fibers depend on the refractive index, materials used, and mode of propagation of light. The classification based on the refractive index is as follows: **Step Index Fibres**: It consists of a core surrounded by the cladding, which has a single uniform index of refraction. **Graded Index Fibres**: The refractive index of the optical fibre decreases as the radial distance from the fibre axis increase (i) On what principle optical fibres works? 1 (ii) For long distance transmission which mode of fibre is used? 1 (iii) What is the refractive index of core and cladding? 2 OR **(iii)** Give the name of two types of optical fibres. 2	
35	**Case Study: Full Wave Rectifier** **Read the following paragraph and answer the questions.** The process of converting alternating voltage/current into direct voltage/current is called rectification. Diode is used as a rectifier for converting alternating current/voltage into direct current/voltage. Diode allows current to pass only, when it is forward biased. So, if an alternating voltage is applied across a diode, the current flows only in that part of the cycle when the diode is forward biased. This property is used to rectify the current/voltage.  (i) For what purpose rectifiers are used? 1 (ii) What do you mean by rectification? 1 (iii) Which property of diode is used in rectification? 2 OR For convert fluctuating DC into constant amplitude DC which components are used? 2	4