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## Kendriya Vidyalaya Sangathan (Jammu Region)

#### Subject : Physics Theory (042)

## Class :12

#### Time : 3 hours

# Max. Marks: 70

### **General Instructions:**

- 1) All questions are compulsory. There are 33 questions in all.
- 2) This question paper has five sections: Section A, B, C, D and E.
- 3)

Section	No. of	Marks	Total
	questions		
А	14	1 Marks each	14
В	2	4 Marks each	08
С	9	2 Marks each	18
D	5	3 Marks each	15
E	3	5 Marks each	15
Total			70

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

S. No.	Question	Marks
	Section – A	
	All questions are compulsory. In case of internal choice, attempt any one of	
	them.	
1	Name the physical quantity having unit weber/ $m^2$ .	1
2	Mention one use of part of electromagnetic spectrum to which a wavelength of 300	1
	nm belongs.	
	OR	
	Write the SI unit of the ratio of Electric field to that of Magnetic field.	
3	What is the amount of work done by the magnetic field? Write the reason also.	1
4	Write any two factors on which inductance of an inductor depend?	1
	OR	
	An alternating current from a source is given by i=10sin314t. What is the rms value	
	and peak value of current?	
5	To which region of the spectrum does the spectral lines of Balmer series belongs?	1
6	If electron and proton have same kinetic energy, which one will have more de-	1
	Broglie wavelength?	
7	In number of unstable nuclei in a radioactive substance become 25% in 64 days.	1
	Find its half-life.	
	OR	
	Define binding energy.	
8	Draw the energy band diagram of p type semiconductor?	1
	OR	
	In full wave rectification, what is the output frequency if input frequency is 50 Hz.	1
9	Write any two changes that takes place when a diode is in reverse biasing?	1
10	Draw the symbol of Diode which emits photons? Under which biasing is it used?	1
	For question numbers 11, 12, 13 and 14, two statements are given-one labelled	
	Assertion (A) and the other labelled Reason (R). Select the correct answer to	
	these questions from the codes (a), (b), (c) and (d) as given below.	

		1
	a) Both A and R are true and R is the correct explanation of A	
	b) Both A and R are true but R is NOT the correct explanation of A	
	c) A is true but R is false	
	d) A is false and R is also false	
11	Assertion (A): In a uniform electric field, a dipole will have only rotatory motion.	1
	Reason (R): In a uniform electric field, a dipole experiences only torque as net force	
	is zero.	
12	Assertion (A): Electric field is always perpendicular to equipotential surfaces and	1
	along the direction of decreasing order of potential	
	Reason (R): SI unit of electric field is V/m.	
13	Assertion (A): A convex mirror always forms virtual images.	1
	Reason (R): Concave lens diverges the parallel rays that are incident on it.	
14	Assertion (A): A pencil placed in a beaker filled with water appears to be tilted/	1
	bent.	
	Reason (R): a ray of light coming from denser medium to rarer medium bends away	
	from the normal.	
	Section – B	
	<b>Ouestions 15 and 16 are Case Study based questions and are compulsory.</b>	
	Attempt any 4 sub parts from each question.	
	Each question carries 1 mark.	
15	The Van De Graff Generator is basically an	
15	electrostatic machine that can generate high	
	voltages. A typical Van De Graff Generator	
	consists of on insulating belt that transports	
	consists of an insulating beit that transports	
	electrical charge to a terminal. The charges that	
	are sent on the belt are generated through a high	
	voltage DC supply. These charges are collected	
	in the inside of the terminal and transferred to its	
	external surface.	
	The first Van de Graff Generator was invented	
	by Dr. Robert J Van De Graff in 1931 in the	
	Unites States of America (USA) for the sole	
	purpose of generating and using high voltages for	
	use in nuclear physics experiments.	
	The Van De Graff generator works simply on the	
	principle of static electricity. All matter, as we	
	know is made up of atoms which further constituted of electrons, neutrons and	
	protons. Electrons carry negative charge whereas protons are considered to be	
	positively charged. When the number of electrons and protons remain the same, the	
	matter is considered to be neutral in charge. A negatively charged matter has more	
	number of electrons than protons while the opposite holds true for a positively	
	charged matter. Electrons can flow from one matter to another	
	Drimarily designed as a particle accelerator, the Van De Graff generators are used in	
	laboratorias for demonstration purposes only. However, it must be noted that Van de	
	Graff generators were one of the first methods used to study puckar physics before	
	the advant of better methods to accelerate particles	
	the advent of better methods to accelerate particles.	
	1. Von de Croff concentor is a device that are a superior	
	1. van de Graff generator is a device that can generate:	
	a) High current	
	b) High potential	
	c) Low potential	1
	d) High magnetic field	

<ul> <li>2. Electrons flow from <ul> <li>a) High potential to low potential</li> <li>b) Low potential to high potential</li> <li>c) Does not depend on potential difference</li> <li>d) None of the above</li> </ul> </li> <li>3. A body can become negatively charged by: <ul> <li>a) Gain of electron</li> <li>b) Loss of electron</li> <li>c) Both a and b</li> <li>d) None of the above</li> </ul> </li> <li>4. Observe the lady shown above, why her hairs are spreading outwards?</li> <li>a) Bocause of current</li> <li>b) She is charged and it is positive charge</li> <li>c) She is charged and it is negative charge</li> <li>c) She is charged and it is negative charge</li> <li>c) She is charged and it is negative charge</li> <li>d) She is charged and it is negative charge</li> <li>d) She is charged and it is positive charge</li> <li>d) She is charged out of the same nature can be positive and negative</li> </ul> 116 The basic medium of fibre optics is a hair-thin fibre that is sometimes made of plastic but most often of glass. A typical glass optical fibre has a diameter of a startably the diameter of the cladding, or outer reflecting layer. The core, or inner transmitting cylinder, may have a diameter as small as 10 gm. Through a process known as total internal reflection. light rays beamed into the fibre can gropagate within the core for great distances with remarkably little attenuation, or reduction in intensity. The degree of attenuation over distance varies according to the wavelength of the light and to the composition of the above <li>1. Out of core and cladding which is denser?</li> <li>a) Care</li> <li>b) Cladding</li> <li>c) Both are equally dense</li> <li>d) None of the above</li> <li>5. Mich of the following is one of the conditions of total internal reflection?</li> <li>a) Light must travel from rare to denser medium</li> <li>b) Angle of incidence should be greater than critical angle</li> <li>c) Angle of incidence should be less than critical angle</li> <li>d) More of the above</li> </th <th></th> <th></th> <th>-</th>			-
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17	An element $\Delta \mathbf{l} = \Delta \mathbf{x} \mathbf{i}$ is placed at the origin and carries a large current $\mathbf{i} = 10$ A.	2
	What is the magnetic field on the y-axis at a distance of 0.5 m. $\Delta x = 1$ cm.	
	<sup>v</sup>	
	P ( )	
	0.15 m	
	$\rightarrow \Delta x \rightarrow x$	
18	In Young's double-slit experiment using monochromatic light of wavelength $\lambda$ the	2
10	intensity of light at a point on the screen where path difference is $\lambda_{\rm c}$ is K units. What	2
	is the intensity of light at a point where path difference is $\lambda/3$ ?	
	OR	
	Draw the shape of the wavefront in each of the following cases:	
	(a) Light diverging from a point source.	
	(b) Light emerging out of a convex lens when a point source is placed at its focus.	
19	Derive the expression of potential due to a short dipole at any arbitrary point.	2
	OR	
	What do you understand by equipotential surface?	1
	What is the net work done when a charge is moved along an equipotential surface	$\frac{1}{2} + \frac{1}{2}$
	and why?	
20	Explain with help of circuit diagram, the working of a special p-n junction diode	2
- 21	which detects the light. Name it.	
21	A long solenoid with 15 turns per cm has a small loop of area 2.0 cm <sup>2</sup> placed inside	2
	the solenoid normal to its axis. If the current carried by the solenoid changes steadily from 2.0 A to $4.0$ A in 0.1 s, what is the induced emf in the loop while the current is	
	changing?	
22	In a Young's double-slit experiment, the slits are separated by 0.28 mm and the	2
	screen is placed 1.4 m away. The distance between the central bright fringe and the	2
	fourth bright fringe is measured to be 1.2 cm. Determine the wavelength of light	
	used in the experiment	
23	Differentiate between p type and n type semiconductor.	2
24	Define the terms magnetic meridian and geographic meridian.	2
	OR	
	Vertical component of earth's magnetic field at a place is $\sqrt{3}$ times the horizontal	2
	component. What is the value of angle of dip at that place?	
25	Draw the ray diagram of astronomical telescope in normal adjustment.	2
	Section -D	
	All questions are compulsory. In case of internal choices, attempt any one.	-
26	A conducting circular loop is placed in a uniform magnetic field $B = 0.020T$ with its	3
	plane perpendicular to the field. Somehow, the radius of the loop starts shrinking at	
	a constant rate of 1mm/s. Find the induced current in the loop at an instant when the	
27	radius is 2011. Write the minerale and working of an ideal voltmator. Nome it	2
27	How can the sensitivity of this instrument be increased?	5
	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.	
28	The work function of caesium metal is 2.14 eV. When light of frequency $6 \times 10^{14}$ Hz	3
	is incident on the metal surface, photoemission of electrons occurs. What is the	-
	(a) maximum kinetic energy of the emitted electrons,	
	(b) Stopping potential, and	
	(c) Maximum speed of the emitted photoelectrons?	

	OD	
	UK Write three properties of photons. Why were theory of light could not explain the	
	while three properties of photons. Why wave theory of light could not explain the	
20	A hydrogen stem initially in the ground level shearths a nuclear which excites it to	2
29	A hydrogen atom initially in the ground level absorbs a photon, which exclus it to	3
20	the $n = 4$ level. Determine the wavelength and frequency of photon.	2
30	a) with the help of Binding energy per nucleon curve explain why it is low for lighter	3
	and very neavy nuclei and high for middle weighted nuclei.	
	b) with the help of law of radioactive decay obtain the expression of half-life.	
	Section – E All questions are compulsory. In ease of internal choices, attempt any one	
21	An questions are compulsory. In case of internal choices, attempt any one.	5
51	inter capacitance of three identical capacitors in series is 1µ1. What will be then het	5
	Eind the ratio of anonaxy stored in the two configurations, if they are both connected	
	to the same source	
	State Gauss's law and use this law to derive the electric filed at a point from an	
	infinitely long straight uniformly charged wire	
	OI	
	a) How does the balancing point of a wheatstone bridge get affected	
	1) Position of cell and Galvanometer are interchanged?	
	11) Position of the known and unknown resistances is interchanged?	
	b) Using Kirchhoff's rules obtain the condition of balanced Wheatstone bridge.	
32	In series LCR circuit with L= 3H, C= $27\mu$ F and R= $30 \Omega$ . at resonance,	5
	Explain the following:	
	a) Write the expression is the frequency at resonance?	
	b) What is impedence at resonance?	
	c) Is the current maximum or minimum?	
	d) Find quality factor? How will it change if resistance increases?	
	OR	
	a) State the principle of transformer.	
	b) Explain with the help of a well labelled diagram, its working and explain why	
	number of turns in secondary coils is the deciding factor of increase or decrease	
	in voltage/ current.	
	c) Why AC is preferred over DC for power transmission over long distances.	
33	a) State Huygen's wave principle.	5
	b) On the basis of Huygen's wave principle explain how central maxima is	
	obtained even though there is only one source	
	OR	
	a) Derive the lens maker formula.	
	b) Three narrow beam of light namely red, green and blue incident on convex	
	lens explain which beam of light will be focussed first and why?	

ENTER YC	OUR ROLL	NUMBER:

## Kendriya Vidyalaya Sangathan (Jammu Region) <u>Marking Scheme</u>

Subject : Physics Theory (042)

Class : 12

S. No.	VALUE POINTS	MARKS
1	Magnetic field	1
2	Any one use of U-V radiation.	1
	Or	
	m/s	1
3	Zero	1⁄2
	Reason	1/2
4	Any two factors	$\frac{1}{2} + \frac{1}{2}$
	Or	1/ 1/
	rms value and peak value	$\frac{1}{2} + \frac{1}{2}$
5	visible	<u> </u>
6	electron	1
/	32 days	1
	Definition	1
8	Correct energy hand diagram	1
0		1
	100 Hz	1
9	Any two changes	$\frac{1}{1/2 + 1/2}$
10	LED forward biasing	$\frac{1}{2} + \frac{1}{2}$
10	a) Both A and R are true and R is the correct explanation of A	1
12	b) Both A and R are true but R is NOT the correct explanation of A	1
13	b) Both A and R are true but R is NOT the correct explanation of A	1
14	a) Both A and R are true and R is the correct explanation of A	1
15	1) B	1
	2) B	1
	3) A	1
	4) D	1
16	1) A	1
	2) C	1
	3) A	1
	4) C	1
17	Formula	1⁄2
	Substitution of values	1/2
	Solution	1/2
10	Direction	1/2
18	Expression of intensity	1
	Solution	1
	Ur Correct wavefront diagrams	1 : 1
10	Diagram	1+1
19	Derivation	1 1/2
	Or	1 /2
	Definition	1
	Zero	1/2
	Correct Reason	1/2
20	Diagram	1
	Working	1⁄2
	Name : photodiode	1⁄2
21	Conversion of given quantities into SI units	1/2
	Correct Formula used and substitution	$\frac{1}{2} + \frac{1}{2}$

<b>F</b>	0.1	1/
	Solution	1/2
22	Conversion of given quantities into SI units	1/2
	Correct Formula used and substitution	$\frac{1}{2} + \frac{1}{2}$
	Solution	<sup>1</sup> /2
23	Any two differences	1+1
24	Definition of the terms	1+1
	Ur	1
	Formula Substitution and solution	1 14 + 14
25	Substitution and solution	$\frac{1}{2} + \frac{1}{2}$
25	$\Delta = \Pi_{2} D$	2
26	$\Phi = \Pi R B$	1
	$d\Psi/dt = 2\Pi r B dr/dt$	
27	e-25μv	1
27	Name: Potentiometer	1/2
	Principle	1
	WORKING Someitivity can be increased by (any method)	1
	Sensitivity can be increased by (any method)	1/2
	Ur	14
	Diagram	<sup>7</sup> /2
	Correct expression	2 14
20	contect expression	<sup>7</sup> /2
28	a) Maximum Kinetic energy b) Stepping potential	1
	a) Maximum speed	1
	C) Maximum speed	1
	UI Three properties of photons (any three)	2* 1/2
	Correct explanation	1 1/2
20	Correct explanation	1 /2
29	Calculation of frequency	1
	Calculation of wavelength	1
30	Correct explanation	1
	Derivation of half life	1 72
21		1 72
51	9μ1 1 · 0	1
	1.9 Statement	1
	Derivation	1
	Or	2
	Vi No change in balanced length	1
	Balanced length will become 100-1	1
	Circuit diagram	1
	Derivation	2
32	Correct expression of frequency	1
52	Impedence is equal to resistance 30 ohm	1
	Current is maximum	1
	Formula of a factor	1
	Calculation	1/2
	$\Omega$ factor decreases as resistance increases	1/2
	Q factor decreases as resistance increases	/2
	Principle	1
	Diagram	1
	Working	1
	Explanation of effect of number of turns	1
	Reason of preference of AC over DC	1
33	Statement of Huygen's wave principle	2
55	Explanation of single slit diffraction experiment	3
	Or	
L	<u> </u>	

### ENTER YOUR ROLL NUMBER:

Derivation	3
Blue	1
Correct Reason	1