KV NO.1,CUTTACK

SET-1

BLUE PRINT

CLASS-XII

SUBJECT-PHYSICS

SESSION: 2019-2020

SL.NO.	Name of chapters	VSA (1 mark)	SA-I (2marks)	SA-III (3 marks)	LA (5 marks)	TOTAL
1	Electric charges and fields	1	-	-	1	2(6)
2	Electrostatic potential and capacitance	1	2	-		3(5)
3	Current electricity	1	2	-		3(5)
4	Moving charges and magnetism	1	2	-		3(5)
5	Magnetism and matter	1	-	1		2(4)
6	Electromagnetic induction	1	-	1		2(4)
7	Alternating current	1	-	1		2(4)
8	Electromagnetic waves	1	-	1		2(4)
9	Ray optics and optical instruments	2	-	-	1	3(7)
10	Wave optics	2	1	1		4(7)
11	Dual nature of radiation and matter	1	-	1		2(4)
12	Atoms	1	-	1		2(4)
13	Nuclei	4	-			4(4)
14	Semiconductor Electronics,materials,devices and simple circuits	2	-		1	3(7)
	TOTAL	20(1)	7(2)	7(3)	3(5)	37(70)

SET-1

MODEL QUESTION PAPER -2020

CLASS-XII SUBJECT-PHYSICS TIME-3 HOURS MAXIMUM MARKS-70

GENERAL INSTRUCTIONS

(i) All questions are compulsory.

(ii) There are 37 questions in total. Section A contains 20 questions of one mark each, Section B contains seven questions of two marks each, Section C contains seven questions of three marks each and Section D contains three questions of five marks each.

(iii) There is no overall choice. However, an internal choice has been provided in five questions of 0ne mark each, two questions of two marks each, two questions of three marks each and all three questions of five marks each. You have to attempt only one of the given choices in such questions.

(iv) Use of calculator is not permitted. However, you may use log tables if necessary.

(v) You may use the following values of physical constants wherever necessary $C=3x10^8$ m/s, $h=6.63x10^{-34}$js, $e=1.6x10^{-19}$ c, $\mu_0=4\pi x10^{-7}$ TmA^{-1}, $1/4\pi€_0=9x10^9$ Nm^2/C^2 $M_e= 9.1x10^{-31}$ kg, Rydberg constant = 1.097×10^7 m^{-1}

SECTION-A

1. A carbon resistor has coloured strips- yellow, violet, gold and gold. What is its resistance?

2. Which property of Zener diode is used in regulating voltage?

3. Write the SI unit for the activity of a radioactive nuclide.

OR

A heavier nucleus of an element splits into two lighter nuclei. If the process is accompanied by release of energy, which of the two parent or the daughter would have higher binding energy per nucleon.

4. Arrange the following in descending order of wavelength:

X-rays, Radio waves, Blue light, Infrared light

5. State the conditions for the phenomenon of total internal reflection to occur.

OR

How does the angle of minimum deviation of a glass prism vary if the incident violet light is replaced by red light?

6. What is the de Broglie wavelength of an electron accelerated from rest through a potential difference of V volts?

7. Ground state energy of hydrogen atom is -13.6 eV. What will be potential energy of the electron in this state?

8. What is the value of earth's magnetic field inside a metallic cage?

9. An electron beam passes through a region of crossed electric and magnetic fields of strength E and B respectively, for what value of electron speed the beam will remain undeflected?

10. What are eddy currents?

OR

Give two application of Eddy current

11. Two nuclei have mass numbers in the ratio 1:8. What is the ratio of their nuclear radii?

12. State the factor, which controls

(a) Wavelength of light and (b) intensity of light emitted by a LED.

13. A nucleus $_{92}U^{238}$ undergoes alpha decay and transforms to thorium. What is

(a) The mass number and

(b) Atomic number of the nucleus produced?

14. Two points P_1 and P_2 are at distances r and 3r respectively from a point charge. What is the ratio of electric field intensities at these points P_1 and P_2?

OR

Equipotential surfaces

i) are closer in regions of large electric fields compared to regions of lower electric fields

ii) Will be more crowded near sharp edges of a conductor.

iii) Will be more crowded near regions of large charge densities

iv) Will always be equally spaced

15. A monochromatic beam sends a plane wave front normal to a narrow single slit. The angular width of the central maxima is measured to be Θ. What will be the angular width if the slit width is reduced to half the original?

16. In an A.C. circuit, the resistance is equal to the reactance. What is the power factor of the circuit?

OR

If the number of turns in a coil doubled, the induced emf due to the same time –varying magnetic flux will get

(a) doubled (b) halved (c) quadrupled (d) none of these

17. The capacitance of a parallel plate capacitor is to be increased from C by inserting either an insulating slab or a conducting slab of thickness d/2 between the plates. Which of the two slabs will be more effective?

18. Four nuclei of an element undergo fusion to form a heavier nucleus with release of energy. Which of the two- the parent or the daughter nucleus- would have higher binding energy per nucleon?

19. The polarising angles for two media X and Y are 45^0 and 50^0. In which of the two media, light travels faster?

20. What will be the effect on image, if lower half of the concave mirror is blackened?

SECTION-B

21. When a resistance of 2 ohm is placed across the terminals of a battery, the current is 0.5 A, when the resistance across the terminals is 5 Ω the current is 0.25 A. Calculate the emf of the battery.

OR

A conductor of length 'l' is connected to a dc source of potential 'V'.If the length of the conductor is tripled by gradually stretching it keeping V constant how will the drift velocity of the electron and resistance of the conductor be affected ? Justify your answer.

22. A particle of mass m, with charge q moving with a uniform speed v normal to a uniform magnetic field B describes a circular path of radius r. Derive the expression for (a) time period of revolution and (b) kinetic energy of the particle.

23. Two circular coils made out of same wire but of radii 30 cm and 60 cm are connected in series. What will be the ratio of the magnetic field at their centres?

24. A slab of material of dielectric constant K has the same area as the plate of a parallel plate capacitor but has a thickness 3d/4. Find the ratio of the capacitance with dielectric inside it to its capacitance without dielectric.

25. In a potentiometer arrangement for determining the emf of a cell, the balance point of the cell in open circuit is 350 cm. When a resistance of 9 ohm is used in the external circuit of the cell, the balance point shifts to 300 cm. determine the internal resistance of the cell.

26. What is electric potential? Derive the relation between electric field intensity and the electrostatic potential at a point taking electric field due to a point charge q.

27. Name the phenomenon which is responsible for bending of light around the corners of an obstacle. Under what condition does the phenomenon take place? Give one application of this phenomenon in nature. What conclusion can we draw about the nature of light from this phenomenon?

OR

When are two objects just resolved? Explain how can the resolving power of a compound microscope be increased? Give relevant formula to support your answer.

SECTION-C

28. (i) Using a neat and labelled diagram, define the three elements required to specify earth's magnetic field at a place.

(ii) The horizontal component of the earth's magnetic field at a given place is 4×10^{-5} Tesla and the angle of dip is 30^0. Calculate the value of

(a) Vertical component.

(b) Total intensity of the earth's magnetic field.

29. State the laws of electromagnetic induction. An athlete peddles a stationary tricycle whose pedals are attached to a coil, having 100 turns each of area 0.1 m^2. The coil is lying in the X-Y plane, is rotated, in this plane, at the rate of 50 r.p.m., about the Y-axis, in a region where a

uniform magnetic field,**B= (0.01) K** Tesla, is present. Find the (i) maximum e.m.f . (ii) Average e.m.f. generated in the coil over one complete revolution.

30. Define effective/r.m.s value of an alternating current. Obtain an expression for the effective/r.m.s current for an A.C represented by $I = I_0 \sin \omega t$.

OR

Show that in a purely inductive circuit current leads ahead of voltage .Draw phasor diagram for voltage current relation .Show that power over a cycle in this circuit is zero. Draw a graph to show the variation of inductive reactance and frequency.

31. (a) Oscillating charges are source of electromagnetic waves. Explain.

(b) Name the part of electromagnetic spectrum used in the following cases

(i) Satellite communication and radar systems

(ii) In water purifiers

(iii) Remote switches in TV sets

(iv) Radio therapy in cancer patients.

32. When un-polarised light is incident on the boundary separating any two transparent media, explain with the help of a suitable diagram, the conditions under which the reflected light gets polarised. Hence define Brewster's angle and write its relationship in terms of the relative refractive index of the two media.

OR

Write Malu's Law in mathematical form. For what distance is ray optics a good approximation when the aperture is 3mm wide and wavelength is 500 nm?

33. The electron in a hydrogen atom, initially in a state of quantum number n_1 makes a transition to a state whose excitation energy with respect to the ground state is 10.2 eV. If the wavelength associated with the photon emitted in this transition is 487.5 nm, find the (i) energy in eV, and (ii) value of the quantum number n_1 of the electron in its initial state.

34. An electron and a photon each have a wavelength 1 nm. Find

(i) Their momenta,

(ii) The energy of the photon

(iii) The kinetic energy of the electron.

SECTION-D

35. (a) Deduce an the expression for the torque acting on an electric dipole of dipole moment P in the presence of a uniform electric field E.

(b) Find the resultant electric field due to an electric dipole at a point x on its equatorial line.

OR

i) Using Gauss law obtain expression for the electric field (i) inside, and outside a positively charged spherical shell

ii) Show graphically variation of the electric field as a function of the distance r from the centre of the sphere.

iii) A square plane sheet of side 10cm is inclined at an angle of 30^0 with the direction of the uniform electric field 200N/C .Calculate the electric flux passing through the sheet

36. (i) A thin lens, having two surfaces of radii of curvature R_1 and R_2,made from a material of refractive index μ_2 is kept in a medium of refractive index μ_1. Derive the Lens maker's formula using this setup.

(ii) A convex lens is placed over a plane mirror. A pin is now positioned so that there is no parallax between the pin and its image formed by this lens-mirror combination. How can this observation be used to find the focal length of the convex lens? Give appropriate reasons in support of your answer.

OR

i) Draw a ray diagram to show the image formation when one concave mirror produces a real, inverted and magnified image of the object.

ii) Obtain the mirror formula and write the expression for the linear magnification.

iii) Give two advantages of a reflecting telescope over a reflecting telescope.

37. (a) Describe briefly, with the help of a diagram, the role of the two important processes involved in the formation of a p-n junction.

(b) Name the device which converts input ac to pulse dc and write its principle.

OR

i) A student wants to use two p-n junction to convert alternating current into direct current. Draw the labelled circuit diagram she would use and explain how it works.

ii) Why are light emitting diodes preferred over conventional incandescent low power lamps?

iii) Write two application of photodiodes

KENDRIYA VIDYALAYA SANGATHAN

SESSION: 2019-2020

MARKING SCHEME(SET-1)

CLASS-XII SUBJECT: PHYSICS TIME: 3 HOURS MAXIMUM MARKS:70

Question No.	Answer key	Value points
	SECTION-A	
1	4.7±5% ohm	1
2	For a large variation of current, voltage across Zener diode does not change.	1
3	Becquerel(Bq) OR Daughter nuclei will have higher binding energy per Nucleon as energy released will lowers the energy and increases the stability	1
4	Radio waves>Infrared light>Blue light>X-rays	1
5	(i) Light goes from denser to rarer media (ii) Angle of incidence in denser medium is greater than the critical angle OR The angle of minimum deviation decreases.	½ ½ 1
6	$12.3/\sqrt{V}$ A^0	1
7	-27.2 eV	1
8	Zero	1
9	V=E/B	1
10	Eddy currents are currents induced in the body of the conductor due to changing magnetic flux through it. OR Any two	1 ½+1/2
11	1:2	1
12	(a) The wavelength of emitted photon depends upon the band gap (b) On increasing forward current, intensity of light first increases and attains a maximum value. After a particular value of forward current, intensity of light begins to decrease.	½ ½
13	(a) 234 (b) 90	½+ ½
14 OR	9:1 a,b,c	1
15	Two times	1
16	$1/\sqrt{2}$ OR A	1 1

17	Conducting slab	1
18	Daughter nucleus	1
19	Medium –X	1
20	No change in the position of image only its intensity will be reduced.	1
	SECTION-B	
21	Emf=(2+r)0.5=(5+r)0.25, emf=1.5 volt OR V_d α 1/l so it becomes 1/3 R =ζl/A it will become 9 times	½+ ½ + 1 ½+1/2 ½+1/2
22	Time period= 2πm/QB and kinetic energy = $q^2B^2r^2/2m$	1+1
23	$B_1/B_2=2/1$ $B=\mu_0 I/2r$	1+1
24	Without dielectric the capacitance is C and with dielectric its capacitance=C_1 C_1= 4Ck/k+3 and the ratio is 4k/k+3	½+1+ ½
25	$r=(L_1-L_2/L_2)R=1.5\ \Omega$	1+1
26	Electric potential at any point is defined as the amount of work done in bringing unit positive charge from infinity to that point against the direction of electric field Relation E= -dv/dr	1 1
27	Diffraction The size of slit must be comparable to the wavelength of light Diamond ring in solar eclipse Wave nature of light OR When central maxima of one object coincides with the first minima of the diffraction pattern of the second object R.P= 2nsinθ/1.22λ It can be increased by changing n or λ	½ ½ ½ ½ ½ ½ ½ ½
	SECTION-C	
28	Labelled diagram Declination: It is the angle made by the north pole shown by the compass needle with true geographic north Inclination: It is the angle subtended by the resultant intensity of earth's magnetic field with the horizontal(surface of the earth) at a place Horizontal component of earth's magnetic field: It is the component of earth's magnetic field along horizontal at a place $B_V=B_H \tan I$ = 0.23 G $B=B_H \sec I$ =0.46 G	½ ½ ½ ½ ½ ½

29	Laws of EMI Whenever there is a change in magnetic flux linked with a coil, an induced emf is developed in it and it continues as long as the magnetic flux continues to change. The magnitude of the induced emf is equal to the rate of change of magnetic flux linked with the coil. Maximum emf=NBAω = 0.52 volt Average emf=0	 ½ ½ 1 1
30	RMS value of AC is that value of steady current which produces the same heating effect in a given resistor in a given time as is done by instantaneous value of AC. Deriving correct Expression of RMS value of AC= $I_0/\sqrt{2}$	1 2
31	Electromagnetic waves are associated with both time varying electric and magnetic fields. An oscillating charge produces both electric and magnetic fields each varying with time. These time varying fields produce each other helping em waves to sustain in space or in a medium. (i) microwaves (ii) ultraviolet radiations (iii) infrared waves (iv) Gamma rays.	1 ½ ½ ½ ½
32	Labelled diagram When unpolarised light is incident on a plane refracting surface separating rarer to denser at an angle of incidence i_p, the reflected light is plane polarised. In this condition, the refracted ray is normal to the reflected ray Brewster's angle: It is the angle of incidence in rarer medium for which the reflected light is plane polarised. Derivation of Brewster's law $\mu_{21}=\tan(i_p)$	½ ½ ½ 1 ½
33	(i) Photon energy = hc / λ = 2.55eV Energy of electron in the excited state= -13.6+10.2 =-3.4 eV Energy of electron in n_1 state= -3.4+2.55= -0.85 eV $-13.6/n_1^2 = -0.85$, $n_1=4$	1 ½ ½ 1
34	(i) $p=h/\lambda= 6.63\times10^{-34}/10^{-9}= 6.63\times10^{-25}$ kgm/sec (ii) energy of photon= hc / λ = 1.99×10^{-16} joule (iii) kinetic energy of electron=$p^2/2m$ =1.5 eV	½+ ½ 1 1
SECTION-D		
35	Deducing correct expression of torque experienced by the dipole in uniform electric field i.e. τ =PE sin Θ with correct figure Resultant electric field due to an electric dipole with correct figure OR	2 ½ 2+ ½ 2+1+2

36	Correct derivation of lens maker's formula with ray diagram The rays must fall normally on the plane mirror so that the image of the pin coincides with itself. So object is at the focus of the lens, hence this distance is called focal length with ray diagram OR Correct diagram Correct derivation Any two points	2+1 1 1 1 2 2
37	(a) Labelled diagram Two important processes during p-n junction formation are diffusion and drift. In a p-n junction, due to this difference in density of the charge carriers, the electrons from n-region diffuse into p- region and holes from p- region to n-region. So positive space charge region is created on n-side and negative region on p-side. Due to the space charge, an electric field is setup from n-side towards p-side resulting in drift of electrons from p to n and holes from n to p opposite to the diffusion current. (b) Rectifier Principle: when ideal diode is forward biased, it conducts and when it is reverse biased, it does not conduct. OR Correct answer with diagram Any two Any two	1 2 ½ ½ 1 2 2 1

PHYSICS SAMPLE PAPER -2
BLUE PRINT

UNIT	CHAPTER NO	NAME OF CHAPTERS	VSA 1 MARK EACH	SA 2 MARKS EACH	LA-1 3 MARKS EACH	LA-2 5 MARKS EACH	TOTAL
I		Electrostatics	**6(6)**	**2(4)**	**2(6)**		**16**
	1	Electric charges and Fields					
	2	Electrostatic potential and Capacitance					

II		Current Electricity					
	3	Current Electricity					
III		Magnetic effects of current and Magnetism	**4(4)**	**1(2)**	**2(6)**	**1(5)**	**17**
	4	Moving Charges and Magnetism					
	5	Magnetism and Matter					
IV		Electromagnetic Induction and Alternating Current					
	6	Electromagnetic Induction					
	7	Alternating Current					
V		Electromagnetic Waves	**4(4)**	**3(6)**	**1(3)**	**1(5)**	**18**
	8	Electromagnetic Waves					
VI		Optics					
	9	Ray Optics and Optical Instruments					
	10	Wave Optics					
VII		Dual Nature of Radiation And Matter	**4(4)**	**1(2)**	**2(6)**		**12**
	11	Dual Nature of Radiation And Matter					
VIII		Atoms and Nuclei					
	12	Atoms					
	13	Nuclei					
IX		Electronic Devices	**2(2)**			**1(5)**	**7**
	14	Semiconductor Electronics: Material, Devices and Simple circuit.					
		TOTAL	**20(20)**	**7(14)**	**7(21)**	**3(15)**	**37(70)**

CLASS-XII (SET-2)

KENDRIYA VIDYALAYA, SANGATHAN,BBSR REGION.
SAMPLE PAPER-2020 (SET-2)

CLASS: XII **M.Marks-70**

SUBJECT: PHYSICS **TIME: 3.00 hr.**

General Instructions:

All questions are compulsory. There are 37 questions in total. Questions 1 to 20 carry one mark each , questions 21 to 27 carry two marks each ,questions 28 to 34 carry three marks each and last three questions carry five marks each. Use of calculators is not permitted .You may use the

following values of physical constants wherever necessary. *C=3x 10^8m/s,* *h=6.63 x 10^{-34} Js ,* *e=1.6 x 10^{-19}C ,* *μ_0=4π X 10^{-7} TmA^{-1},* *(1/4πε_0) = 9 X 10^9 Nm^{2}C^{-2} ,* *m_e=9.1 x 10^{-31} kg.*

SECTION-A

1. The threshold wavelength for a metal having work function W_0 is λ. What is the threshold wavelength for the metal having work function $2W_0$?

(i) 4λ (ii) 2λ (iii) λ/2 (iv) λ/4

2. If the magnetizing field on a ferromagnetic material is increased, its permeability

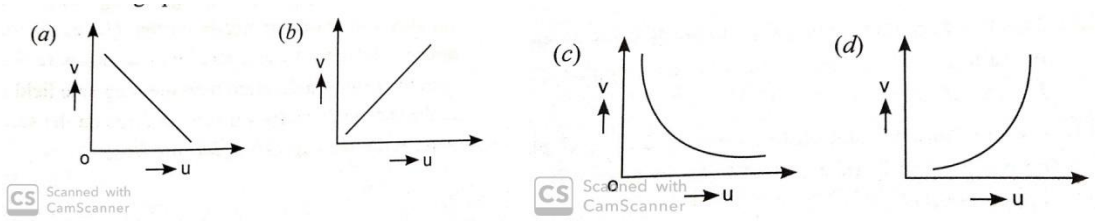
(i) Is decreased (ii) is increased (iii) is unaffected (iv) may be increased or decreased

3. A point charge q is placed at a distance a/2 directly above the centre of a square of side a. The electric flux through the square is

(i) q/ε_0 (iii) $q/4\varepsilon_0$

(ii) $q/\pi\varepsilon_0$ (iv) $q/6\varepsilon_0$

4. In an experiment to find focal length of a concave mirror, a graph is drawn between the magnitude of u and v. The graph looks like



5. The radii of two metal spheres A and B are r_1 and r_2 respectively ($r_1 > r_2$). They are connected by a thin wire and the system is given a certain charge. The charge will be greater

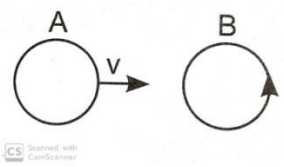
(i) On the surface of the sphere B (iii) equal on both

(ii) On the surface of square A (iv) zero on both

6. The transition from the state n=5 to n=1 in a hydrogen atom results in UV radiation. Infrared radiation will be obtained in the transition

(i) 2 ⟶ 1 (ii) 3 ⟶ 1 (iii) 4 ⟶ 3 (iv) 6 ⟶ 2

7. There are two coils A and B as shown in fig. Current starts flowing in B as shown, when A is moved towards b and stops when A stops moving. The current in A is counterclockwise. B is kept stationary when A moves. We can infer that



(i) There is a constant current in the clockwise direction in A.

(ii) There is varying current in B

(iii) There is no current in A

(iv) There is a constant current in the counterclockwise direction in A.

8. The drift velocity of the free electrons in a conducting wire carrying a current 'I' is v. If in a wire of the same metal, but of double the radius, the current be '2i', then the drift velocity of electrons will be

(i) v/4 (ii) v/2 (iii) v (iv) 4v

9. Which radiations are used are used in muscle ache?

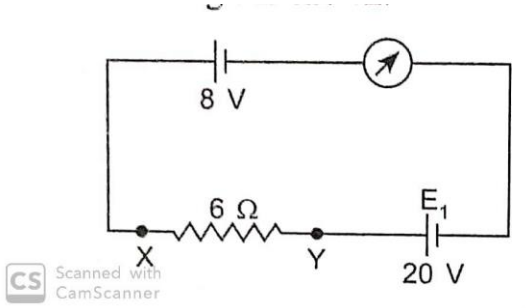
(i) Infrared (ii) Ultraviolet (iii) Microwaves (iv) X-rays

10. A n-type semiconductor is

(i) Negatively charged (iii) positively charged

(ii) Neutral (iv) none of these

11. In the circuit diagram show:



(i) What will be the reading in the ideal ammeter?

(ii) Will the current flows along X to Y or Y to X

12. The power factor of an ac circuit is 0.5. What is the phase difference between voltage and current in this circuit?

OR

The reactance of a capacitor C is X. If both the frequency and capacitance be doubled, what will be the new reactance?

13. The peak value of emf in ac is E_0. Writes its (i) rms and (ii) average value over a completecycle.

14. A hollow metal sphere of radius 10 cm is charged such that the potential at its surface is 20 V. What is the potential at the centre of the sphere?

15. What do you understand by dynamic resistance of p-n junction diode?

OR

What is internal field emission?

16. The angle between the pass axes of a polarizer and analyser is 45^0. Write the ratio of the intensities of original light and the transmitted light after passing through the analyser.

17. Two point charges having equal charges separated by 1 m distance experiences a force of 16 N. What will be the force experienced by them, if they are held in water , at the same distance? (Given $K_{water}=80$)

18. A converging lens of of refractive index 1.5 is kept in a liquid medium having the same refractive index. What is the focal length of the lens in this medium?

19. Show on a graph the variation of the de Broglie wavelength (λ) associated within electron with the square root of accelerating potential.

OR

For a given photo sensitive material and with a source of constant frequency of incident radiation, plot a graph showing the variation of photo current with the intensity of incident light.

20. Two nuclei have mass numbers in the ratio 1:8.What is the ratio of their nuclear radii?

SECTION-B

21. Name the part of electromagnetic spectrum whose wavelength lies in the range 10^{-10} m. Give its one use.

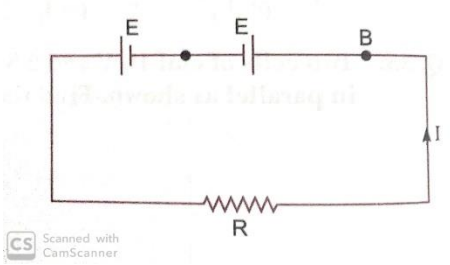
22. Two slits are made of one millimeter apart and the screen is placed one metre away. What should the width of each slit be to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern?

OR

In Young's double slit experiment using monochromatic light of wavelength λ the intensity at a point on the screen where path difference λ is K units. What is the intensity of light at a point where path difference is λ/3?

23. Derive an expression for the de Broglie wavelength associated with an electron accelerated through a potential V. Draw a schematic diagram of a localized wave describing the wave nature of the moving electron.

24. Two cells of same emf Ɛ but internal resistance r_1 and r_2 are connected in series to an external resistor R as given in fig. What should be the value of R so that the potential difference across the terminals of first cell becomes zero.



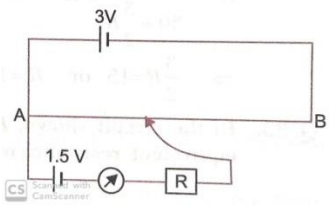
25. The instantaneous current in an ac circuit is I= 0.5 sin314 t, what is (i) rms value and (ii) frequency of the current.

26. Explain briefly how electromagnetic waves are produced by an oscillating charge. How is the frequency of em waves produced related to that of the oscillating charge?

OR

How are infrared waves produced? Write their two important uses .

27. A potentiometer wire of length 1m is connected to a driver cell of emf 3 V as shown in fig. When a cell of 1.5 V emf is used in the secondary circuit, the balance point is found to be 60 cm.



(i) Explain with reason, whether the circuit works , if the driver cell is replaced with a cell of emf 2 V.

(ii) Does the high resistance R, used in the secondary circuit affect the balance point? Justify your answer.

SECTION-C

28. Define the term 'electric dipole moment'. Is it a scalar or vector?
Deduce an expression for the electric field at a point on the equatorial plane of an electric dipole of length 2a.

29. Show diagrammatically the behavior of magnetic field lines in the presence of (i) paramagnetic and (ii) diamagnetic substances. How does one explain these distinguishing feature?

OR

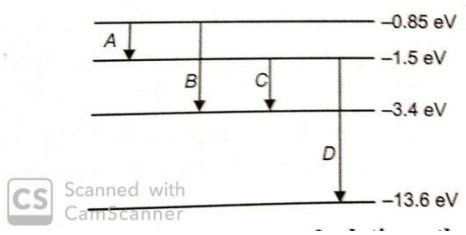
The relative magnetic permeability of a magnetic material is 800. Identify the nature of magnetic material and state its two properties.

30. Why cannot two independent monochromatic sources produce sustained interference patterns? Deduce, with the help of Young's arrangement to produce interference pattern, an expression for the fringe width?

31. The short wavelength limit for the Lyman series of the hydrogen spectrum is 913.4 A^0. Calculate the short wavelength limit for Balmer series of the hydrogen spectrum.

OR

The energy levels of an element are given below.



Identify , using necessary calculations, the transition, which corresponds to the emission of a spectral line of wavelength 482 nm.

32. The magnetic flux linked with the closed circular loop of radius 20 cm and resistance 2 ohm at any instant of time is $\Phi=4t+3$
Where Φ is in milliweber and 't' is in sec.
Find (i) flux linked with a loop at t=3 s
(ii) Induced emf at t=2 s and
(iii) Plot a graph between (a) Φ and t (b) $\mathcal{E}$ and t

33. (a) Derive the relation between the decay constant and half life of a radioactive substance.
(b)A radioactive element reduces to 50% of its initial mass in 1000 years. Find its half life.

OR

(a) Define the term Half life.
(b) A radioactive isotope has a half life of T years. After how much time its activity reduces to 6.25% of its original activity?

34. Find the ratio of potential differences that must be applied across the parallel and the series combination of two capacitors C_1 and C_2 with their capacitances in the ratio 1:2 so that energy stored in the two cases , becomes the same.

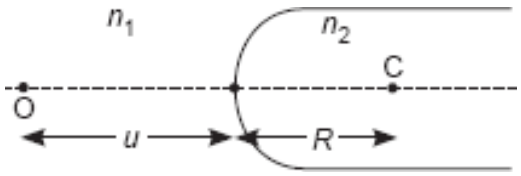
SECTION-D

35. (a) A long straight wire of a circular cross-section of radius a carries a steady current I. The current is uniformly distributed across the cross section. Apply Ampere's circuital law to calculate the magnetic field at a point r in the region for (i) r<a and (ii) r> a. Plot a graph showing the nature of this variation.
(b) Calculate the ratio of magnetic field at a point a/2 above the surface of the wire to that a point a/2 below its surface.
What is the maximum value of the field of this wire?

OR

(a) Draw a labelled diagram of moving coil galvanometer. Describe briefly its principle and working.
(b) A galvanometer of resistance 80Ω, shunted by a resistance of 20Ω is joined in series with a resistance of 200 Ω and a cell of emf 1.5 V. What is the sensitivity of the galvanometer if it shows a deflection of 30 division?

36. (a) A point object O is kept in a medium of refractive index n_1 in front of a convex spherical surface of radius of curvature R which separates the second medium of refractive index n_2 from the first one, as shown in the figure.



Draw the ray diagram showing the image formation and deduce the relationship between the object distance and the image distance in terms of n_1, n_2 and R.

(b)When the image formed above acts as a virtual object for a concave spherical surface separating the medium n_2 from n_1 ($n_2 > n_1$), draw this ray diagram and write the similar relation.(similar to (a)). Hence obtain the expression for the Lens Maker's formula.

OR

(a) Using Huygen's construction ofsecondary wavelets explain how a diffraction pattern is obtained on a screen due to a narrow slit on which a monochromatic beam of light is incident normally.

(b) Show that the angular width of the first diffraction fringe is half of the central fringe.

(c) Explain why the maxima at $\theta = (n+1/2)\lambda/a$ become weaker and weaker with increasing n.

37. (a) Distinguish between an intrinsic semiconductor and a p-type semiconductor. Give reason why a p-type semiconductor crystal is electrically neutral, although $n_h >> n_e$.

(b)Name the important process that occurs during the formation of a p-n junction .

Explain briefly, with the help of suitable diagram, how a p-n junction is formed.

Define the term ‘barrier potential’.

OR

(a) Write the important considerations which are to be taken into account while fabricating a p-n junction diode to be used as a Light Emitting Diode (LED). What should be the order of band gap of an LED, if it is required to emit light in the visible range? Draw the circuit diagram and explain its action.

(b) Draw V-I characteristics of an LED. State two advantages of LED lamps over conventional incandescent lamps.

MARKING SCHEME(SET-2)

CLASS-XII (PHYSICS)

QNS NO	Expected Answer	Value point
1	(iii)$\lambda/2$	1
2	(i)is increased	1
3	(iv)$q/6\varepsilon_0$	1

4	©	1
5	(ii)on the surface of square A	1
6	(iii) 4 ⟶3	1
7	(iv)There is a constant current in the anticlockwise direction in A.	1
8	(ii)v/2	1
9	(i)infrared	1
10	(ii)neutral	1
11	(i)correct reading (ii)correct direction	½ 1/2
12	Correct formula Correct answer	½ 1/2
13	(i)correct rms value (ii)correct average value	½ 1/2
14	Correct answer	1
15	Correct answer	1
16	Correct formula Correct answer	½ 1/2
17	Correct formula Correct answer	½ 1/2
18	Correct answer	1
19	Correct graph Or Correct graph	1 1
20	Correct answer	1
21	Correct name Correct use	1 1
22	$10\lambda D/d = 2\lambda D/a$ $\Rightarrow a=d/5=0.2$ mm OR Resultant intensity when path diff. is λ is $I_1=2I+2I=4I=K$ Resultant intensity when path diff. $\lambda/3=2I+2I\cos120^0=I=K/4$	1 1 1 1
23	Correct derivation Diagram	1 1
24	$I=(\mathcal{E}+\mathcal{E})/(R+r_1+r_2)$ $V=\mathcal{E}-Ir_1=0$ On solving we get $R=r_1-r_2$	½ ½ 1

25	(i)$I_{rms}=I_0/\sqrt{2}$ $=0.5/\sqrt{2}=0.35$ A (ii)$\nu=\omega/2\pi$ $=314/2\pi=50$Hz	½ ½ ½ 1/2
26	Explanation for production Explanation for relation OR Reason Two uses	1 1 1 1
27	(i) Circuit will not work Reason:Total voltage across AB will 2 V, which cannot balance the voltage 3V. (ii) No. Since at balance point no current flows through Galvanometer.	½ ½ ½ ½
28	Definition and correct answer Derivation	½ +1/2 2
29	Diagram (i) and (ii) Explanation OR Identification Two properties	1+1 1 1 2
30	Correct reason Derivation	1 2
31	$1/\lambda=R(\frac{1}{n_1^2}-\frac{1}{n_2^2})$ For short wave of lyman series $n_1=1$ and $n_2=\infty$ Hence $1/\lambda_L=R \Rightarrow \lambda_L=1/R=931.4$ A^0 For short wave of Balmer series, $n_1=2$ and $n_2=\infty$ Which gives $\lambda_B=4/R=4X931.4=3653.6A^0$ OR $E=(hc/\lambda e)$ eV =2.57 eV For line C, $E_1-E_2=2.55$eV This confirms transition C	½ ½ ½ ½ 1 ½ 1 1 ½
32	(i)flux at t=3s=15mWb (ii)Induced emf at t=2s=4mV (iii)graphs(two)	1 1 ½ +1/2
33	(a)Derivation (b)Calculation of Half life =1000 years	2 1
34	$E_p=E_s$ $C_pV_1^2=C_sV_2^2$ $V_1/V_2=\sqrt{2}/3$	 ½ 1.5

35	Calculation of magnetic field at (i)r<a (ii)r>a Graph Ratio calculation Maximum value OR Labelled diagram Principle Working (b)Net resistance=216 ohm I=1.5/216 A I_g=I/5=1.4 x 10^{-3} A Current sensitivity =θ/I_g=21428.5 div./amp.	1+1 1 1 1 1 ½ 1.5 ½ ½ ½ 1/2
36	(i) Ray diagram Derivation of formula (ii) Ray diagram Write the correct relation Obtain Lens Maker's formula OR (i) Correct figure of division of slits into smaller parts Expression for central maxima Expression for first maxima Expression for first minima (ii) Derivation of fringe width (iii) Correct explanation	½ 2 ½ 1 1 1/2 1.5 1 1 1/2 1/2
37	Distinguish Reason Important process Correct explanation of formation of p-n junction Definition of 'Barrier potential' OR (a)Important consideration Order of band gap Circuit diagram Explanation (b)V-I Characteristics Two advantages	1 1 1 1 1 1 ½ ½ 1 1 1

BLUE PRINT (SET-3)
PHYSICS
CLASS-XII
(2019-2020)

		No of questions	

S.No	Unit	VSA (1 mark)	SA-I (2marks)	SA-II (3marks)	L.A. (5 marks)	Total Mark	Total Mark
1	Electrostatics	4			1	9	16
2	Current Electricity	5	1			7	
3	Moving charges & Magnetism	1	2	1	-	8	17
4	Electromagnetic Induction and Alternating Current	1		1	1	9	
5	Electromagnetic waves.	1	-	1	-	4	18
6	Optics	4	1	1	1	14	
7	Dual nature of Radiation and matter.	2		1	-	5	12
8	Atoms and Nuclei	-	2	1	-	7	
9	Electronic Devices	2	1	1		7	07
	Total	20X1=20	7X2=14	7X3=21	3X5=15	70	

KENDRIYA VIDYALAYA SANGATHAN

Bhubaneswar Region

SAMPLE PAPER-3, 2019-20

PHYSICS (Theory)

Maximum Marks- 70 Time allowed-3 hours

General Instructions:-

(i) All questions are compulsory

(ii) There are 37 questions in total.Questions 1to 20 are very short answer type and carry 1 mark each.

(iii) Questions 21to 27 carry 2 marks each,questions 28 to 34 carry 3 marks each,and questions35 to 37 carry 5 marks each.

(iv) There is no overall choice. However an internal choice has been provided in one questions of 1mark, one question of 2 marks, two questions of 3 marks and all questions of 5 marks each

(v) You may use the following values of physical constants wherever necessary

$c = 3\times10^{8}$ *m/s,* $h = 6.6\times10^{-34}$ *Js,* $e = 1.6\times10^{-19}$ *C* $\mu_o = 4\pi\times10^{-7}$ *Tm/A,* $\varepsilon_o = 8.85\times10^{-12}$ C^2/Nm^2

SECTION A(1x20)

1. When the separation between two charges is increased, the electric potential energy of the charges
   a) Increases b) decreases c) remains same d) may increase or decrease
2. An electric dipole is placed in a uniform electric field. The net electric force on the dipole
   (a) is always zero
   (b) depends on the orientation of the dipole
   (c) can never be zero
   (d) depends on the strength of the dipole
3. A charge Q is placed at the centre of a cube. How much electric flux is passing through one face of the cube?
4. The capacitance of a parallel plate capacitor does not depend on
   (a) the size of the plates
   (b) the charges of the plates
   (c) separation between the plates
   (d) nature of medium between the plates
5. If the voltage across a capacitor is made double, by what factor does the electrostatic energy stored increase?
6. Two resistors A and B have resistances R_A and R_B respectively such that $R_A > R_B$ .The resistivities of their materials are $\rho_A$and $\rho_B$respectively.
   (a) $\rho_A > \rho_B$ (b) $\rho_A < \rho_B$ (c) $\rho_A = \rho_B$(d) The information is not sufficient to find the relation between $\rho_A$and ρ_B
7. Would you prefer a voltmeter or apotentiometer to measure the emf of a battery? Give reason.
8. Kirchhoff's junction rule is a consequence of the principle of conservation of_____. (charge/energy/mass/momentum)
9. Two resistors R and 2R are joined in parallel across a source. The thermal energy developed in them is in the ratio_____.
10. Can a charge particle be accelerated by a magnetic field? Can its speed be increased?
11. The value of power factor at resonance in a series LCR circuitis_____.

OR

A piece of metal surrounded by a coil carrying high frequency alternating current gets heated up. Give reason

12. Why are microwaves preferred over infrared in a RADAR system?
13. A ray of light from air is incident on medium A, B, C in turn, with same angle of incidence (45^0). The angle of refraction in the mediums is 40^0, 35^0 and 30^0 respectively. In which medium is the speed of light maximum?
14. The focal length of a lens does not depend upon the
    (a) Curvatures (b) refractive index of the lens medium (c) aperture of the lens.
15. Assume light is travelling from air to glass. The frequency of light_____ (remains the same/increases/decreases) in this process.
16. What is the effect on the fringe spacing in interference pattern, if red light is replaced by green light?
17. Define the term threshold frequency in relation to photoelectric effect.
18. An electron and a proton are travelling with the same momentum. Compare their de-Broglie wavelength.
19. Name the special diode that can be used as an optical detector.
20. The frequency of light emitted by an LED depends on the_____of the material using which it is fabricated.

SECTION B (2x7)

21. Two resistances 2ohm and 3 ohm are joined in series and connected across a 10 volt battery. Now, a capacitor of 5μF is connected across the first resistor. How much charge would be stored in it?

OR

Plot a graph showing the variation of resistivity with temperature in the case of a i) conductor ii) semiconductor.

22. An electron and a proton are projected into a perpendicular magnetic field with same velocity. The electron describes a circle of radius r in clockwise manner.
    Will the sense of revolution of the proton be same or opposite? Will the radius in case of proton be less/same/more than r? Justify your answer.
23. Using Ampere's circuital law, obtain the expression for the magnetic field due to a very long straight conductor carrying current.
24. A hydrogen sample is prepared in a particular excited state A. Photons of energy 2.55eV get absorbed into the sample to take some of the electrons to a higher excited state B. find the quantum numbers of the state A and B.
25. State the law of radioactive decay. Define the term decay constant. The half-life of a particular radioactive sample is 20yrs. In how many years will its activity reduce to 6.25% of its initial activity?
26. (a) The magnification produced by three mirrors X, Y, Z is -1, 0.5, and 1.5 respectively. Identify these mirrors.
    (b) If a spherical mirror is placed inside water, will its focal length increase/decrease or remain the same? Support your answer with reasons.

27. Why are photo diodes preferably operated in reverse bias when the current in the forward bias is known to be more than in reverse bias? State one difference between photo diode and solar cell in terms of biasing.

SECTION C (3x7)

28. The magnetic susceptibilities of materials A, B, C are -0.001, 0.005, 2500 respectively. Identify these materials. The material A is placed in an external uniform magnetic field. Depict the modified pattern of field lines.

    If the absolute temperature of material C is increased significantly, will there be a change in itsmagnetic susceptibility? Justify your answer.

29. (i) How are electromagnetic waves produced?

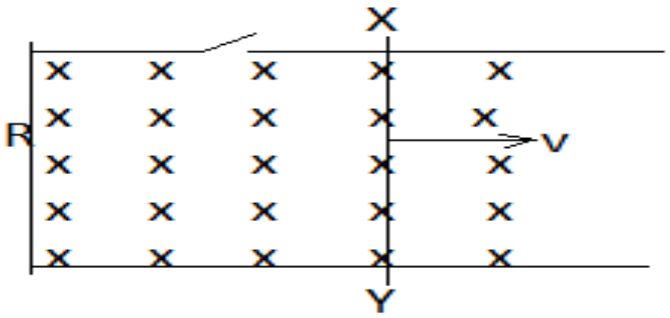
    (ii)Derive an expression for displacement current and hence write the modified form of Ampere's circuitallaw.

30. Write the expression for the resultant intensity at a point due to the superposition of two monochromatic waves each of amplitude 'a' having a phase difference ϕ.

    In Young's double slit experiment using monochromatic light of wave length λ, the intensity of light at a point on the screen where path difference is λ, is K units. Find the intensity at appoint on the screen where path difference is λ/4.

31. Draw the circuit diagram of a p-n diode used as a full wave rectifier. Explain its working with input and output sketches

32. A conducting rod XY of length l is being moved towards right in a magnetic field as shown in the figure. What is the nature of charges induced at X and at Y when the key is open? Find is the magnitude and direction of current induced when the key is closed?



OR

A rectangular coil of area A, having N turns is being rotated in a uniform magnetic field B, with a uniform angular speed w. Derive the expression for the emf induced across the coil. What is the average value of this emf over one complete rotation of this coil? Graphically show the variation of such emf with time.

33. If light of wavelength 412.5nm is incident on each of the metals given below, which ones will show photo electric emission and why?

Metals	Work function(eV)

Na	1.92
K	2.15
Ca	3.20
Mo	4.17

How does the stopping potential change on increasing the wavelength of radiation?

OR

(i) The ground state energy of hydrogen atom is -13.6eV. Find out the kinetic energy and the potential energy in the ground state and the first excited state.

(ii) Find the ratio of de-Broglie wavelengths associated with a proton and an alpha particle accelerated through same V.

34. Give a plot of the variation of binding energy per nucleon with mass number (A). On the basis of the curve explain why energy would be released in the process of fission and fusion

SECTION D (5x3)

35. (a) Using Gauss' law, derive the expression for the electric field at appoint (i) outside and (ii) inside a uniformly charged thin spherical shell. Draw a graph showing E as a function of distance from the Centre.

(b) Two thin concentric shells of radii r_1 and r_2 ($r_2>r_1$) have charges q_1 and q_2. Write the expression for the potential at the surface of inner and outer shells.

OR

(a) Obtain the expression for the potential due to an electric dipole of dipole moment P, at a point x, on the axial line.

(b) Write the expression for potential energy of a dipole in an external uniform electric field. For what orientation does the dipole remain in (i) most stable (ii) most unstable equilibrium state?

36. (a) An ac source of voltage $V=V_0 Sin\omega t$ is connected across a series combination of an inductor, a capacitor and a resistor. Use the phasor diagram to obtain the expression for (i) impedance of the circuit and (ii) phase angle between the voltage and current.

(b) A capacitor of unknown capacitance, a resistor of 100 ohm and an inductor of self-inductance $L=4/\pi^2$ Henry are in series connected to an ac source of 200 V and 50 Hz. Calculate the value of the capacitance and the current that flows when the current is in phase with the voltage.

OR

Explain with the help of a labeled diagram, the principle and working of a transformer. Deduce the expression for its working formula.

A transformer has 2000 turns in its primary, and 200 turns in its secondary. Its primary is connected across an ac source of 240 V and the secondary is

connected across a resistor of 20 ohm. Calculate the current in secondary and primary.

37. a) Draw a ray diagram to show the refraction of light by an equilateral prism. Using the condition of minimum deviation, obtain the refractive index of the material of the prism.

b) A beam of light converges at a point P. Now a lens is placed 12cm from P. At what point does the beam converge if the lens is (i) a convex lens of focal length 20cm (ii) a concave lens of focal length 16cm?

OR

State Huygen's principle of construction of wave front.

Draw a diagram showing the propagation of a plane wave front from a rarer to a denser medium and verify Snell's law of refraction.

Show that frequency of wave does not change as it goes from one medium to another.

MARKING SCHEME / PHYSICS / SAMPLE PAPER-3

Q.No.	CORRECT ANSWER/RESPONSE	VALUE POINT	TOTAL MARK
1	(d)	1	1
2	(a)	1	1
3	Q/ϵ_0	1	1

4	(b)	1	1
5	4 times	1	1
6	(d)	1	1
7	Potentiometer does not draw any current from the cell	1	1
8	Charge	1	1
9	2/1	1	1
10	Yes/no	0.5+0.5	1
11	1 OR due to eddy currents	1	1
12	Due to their smaller wavelength microwaves are suitable	1	1
13	Medium-A due to smaller ref. index.	0.5+0.5	1
14	Aperture of the lens	1	1
15	Remains the same	1	1
16	Decreases due to decrease in wavelength	0.5+0.5	1
17	Correct def^{n}	0.5+0.5	1
18	1:1	1	1
19	photodiode	1	1
20	Band gap	1	1
21	Cal^{n} of I=2A Cal^{n}of V=4V Cal^{n}of Q OR Two plots explanation	0.5 0.5 1 1 1	2
22	Opposite Greater	1 1	2
23	Ampere's law Correct derivation	1 1	2
24	n=3 to n=2	2	2
25	Law def^{n} calculation of t=80yrs	0.5 0.5 1	2
26	(a) Correct identification (b) remain same	1.5 0.5	2
27	Correct explanation Difference	1 1	2
28	Identification of materials Pattern of field lines Susceptibility decreases	1 1 1	3
29	(i) acceleration of charges (ii) derivation and expression	1 2	3
30	Correct expression of intensity	1	3

	Solving for intensity	2	
31	Diagram Explanation of working Sketches of input output	1 1 1	3
32	X +ve and Y –ve Derivation of current and direction	1 1.5+0.5	3
33	Calculation of energy of photon Naming of metals Effect on stopping potential OR Calculation of K.E. and P.E. Comparison of wavelengths	1 1 1 1 2	3
34	B.E./A plot Explanation of energy release	1.5 1.5	3
35	(a) derivation (b) expression	3 2	5
36	(a) derivation (b) Calculation	3 2	5
37	(a) derivation with diagram (b) Calculation/explanation	3 2	5

KENDRIYA VIDYLAYA SANGATHAN BHUBANESWAR REGION

SAMPLE PAPER-4(2019-20) CLASS : XII

Subject : Physics

BLUE PRINT

S. No	Chapters	Very Short Answer	Short Answer-I	Short Answer -II	Long Answer	Total Marks

		(VSA) (1 mark)	(SA-I) (2 marks)	(SA-II) (3 marks)	(L.A.) (5 marks)	
1	Electrostatics and Current electricity(Unit1)	6	1	1	1	16
2	Moving charges and magnetism. EMI and AC(Unit2)	5	2	1	1	17
3	, EMW Ray and wave optics. Unit 3)	6	2	1	1	18
4	Dual Nature Atoms and Nuclei (Unit 4)	1	1	3		12
5	Semiconductor	2	1	1	-	07
	TOTAL	20X1=20	7X2=14	7X3=21	3X5=15	70

KENDRIYA VIDYLAYA SANGATHAN BHUBANESWAR REGION

SAMPLE QUESTION PAPER-4

PHYSICS (THEORY) CLASS XII

MM: 70 **TIME: 3HRS**

GENERAL INSTRUCTIONS:

1. All question are compulsory. There are **37** questions in all.

2. The question paper has four sections: Section A, Section B, Section C, Section D.

3. **Section A** contains **20** objective questions of **one** mark each, **Section B** contains 7 questions of **two** marks each, **Section C** contains **7** questions of **three** marks each, and **Section D** contains **three** questions of **five** marks each.

4. There is no overall choice in the paper. However, there will be atleast 33% internal choice.

Section A

Q1. Two charges are placed at a distance apart. If a glass slab is placed between them, force between them, force between them will

(a) Be zero (b) increases (c) decreases (d) remains the same

Q2. When an electron approaches a proton, their electro static potential energy

(a) Decreases (b) increases (c) remains unchanged (d) all the above

Q3.The angle between electric dipole moment p and the electric field E when the dipole is in stable equilibrium

(a) 0 (b) $\pi/4$ (c) $\pi/2$ (d) π

Q4. Which of the following characteristics of electrons determines the current in a conductor?

(a) Drift velocity alone. (b) Thermal velocity alone (c) both drift velocity and thermal velocity

(d) Neither drift nor thermal velocity

Q5. Two cells of emfs approximately 5 V and 10 V are to be accurately compares using a potentiometer of length 400 cm.

(a) The battery that runs the potentiometer should have voltage of 8 V
(b) The battery of potentiometer can have a voltage of 15 V and R adjusted so that the potential drop across the wire slightly exceeds 10 V
(c) The first portion of 50 cm of wire itself should have a potential drop of 10 V
(d) Potentiometer is usually used for comparing resistances and not voltages

Q6. An energy source will supply a constant current into the load if its internal resistance is

(a) Very large as compared to the load resistance
(b) Equal to the resistance of the load.
(c) Non- zero but less than the resistance of the load.
(d) Zero.

Q7. The time period of a charged particle undergoing circular motion in a uniform magnetic field is independent of

(a) its speed (b) its mass (c) its charge (d) the magnetic field

Q8. Which of the following does not exist?

(a) isolated electric charge (b) isolated magnetic poles (c) electric dipole (d) magnetic dipole

Q9. Lenz's law is a consequence of the law of conservation of

(a) charge (b) mass (c) momentum (d) energy

Q10. Energy is stored in a current carrying coil in its

(a) electric charge (b) magnetic field (c) dielectric strength (d) heat

Q11. The conductivity of semiconductor increases with increase in temperature, because:

(a) Relaxation time increases
(b) Both number density carries and relaxation time increases
(c) Number density free current carries increases.
(d) Number density carries increases, relaxation time decreases but effect of decrease in relaxatation time is much less than increase in number density.

Q12. If the number of turns in a coil doubled, the induced emf due to the same time –varying magnetic flux will get

(b) doubled (b) halved (c) quadrupled (d) none of these

Q13. Which law states that a variation in the electric field produces a magnetic field?

(a) Biot-Savart law

(b) Lenz's law.

(c) The modified Ampere's Law.

(d) Faraday's law.

Q14. An object is placed between two parallel plane mirrors. The number of image seen will be

(a) 2 (b) 6 (c) 10 (d) infinite

Q15. Which of the following phenomena cannot be explained by assuming light waves to be longitudinal?

(a) Interference (b) Diffraction (c) Reflection (d) Polarization

Q16. Newton believed light to consists of

(a) air particles (b) ether particles (c) dust particle (d) corpuscles

Q17. The ratio of the intensities of two light waves is given by 4:1. The ratio of the amplitudes of the waves is

(a) 2:1 (b) 1:2 (c) 4:1 (d) 1:4

Q18. The angle between the direction of propagation and the plane of polarization is

(a) 0^0 (b) 45^0 (c) 90^0 (d) 180^0

Q19. Which of the following is not emitted during the decay of a radioactive substance?

(a) Proton (b) neutrino (c) helium nucleus (d) electron

Q20. On increasing the temperature, the resistivity (or the specific resistance) of a conductor and a semiconductor

(a) increases (b) decreases (c) increases and decreases respectively (d) decreases and increases respectively

SECTION B

Q21. Write S.I. unit and dimensional formula for current density.

Q22. State the rule which gives direction of Lorentz's magnetic force on a moving charge.

Q23. Give two essential characteristics of material used for preparing an electromagnet.

Q24. State the condition under which a microwave over heats up a food item contains water molecule must efficiently.

Q25. Write the formula for refractive index of a liquid in terms of its real depth and apparent depth in a tank. Represent graphically the variations of apparent depth with refractive index of liquid filled in a given tank.

Q26. Do all the electrons that absorbs a photon come out as photoelectrons

OR

Two particles A_1 and A_2 of masses m_1, m_2 ($m_1 > m_2$) have the same de Broglie wavelength than which possesses more kinetic energy?

Q27. Three photo divides D_1, D_2 and D_3 are made of semiconductors having band gaps of 2.5 eV, 2eV and 3eV respectively. Which one will be able to detect light of wavelength 6000 Å?

SECTION-C

Q28. Find the electric field intensity due to uniformly charged spherical shell of radius R at a point (i) r=R (ii) r>R (iii) r<R

Q29. A certain galvanometer of resistance of is converted to (i) an ammeter of range I ampere (ii) an ammeter of range 2i ampere (iii) a voltmeter of range V volts. (iv) a voltmeter of range 2V volts.

The resistance of the resulting instruments R_1, R_2, R_3 and R_4 respectively. Arrange R_1 , R_2 , R_3 and R_4 and in decreasing order.

OR

How we can increase the sensitivity of moving coil galvanometer? Is voltage sensitivity depends upon the current sensitivity of galvanometer?

Q30. A double convex lens has surfaces with radii of curvature 10cm and 15cm. its focal length in air is 12cm. The refractive index of the material is?

Q31. Two particles A and B of de- Broglie wavelength λ_1 and λ_2 combine to form a particle C. the process conserve momentum. Find the de-Broglie wavelength of the particle C.

Q32. (I) In the explanation of photoelectric effect, we assume one photon of frequency v collided with an electron and transfer its energy. This leads to the equation for the maximum energy E_{max} of the emitted electron as

$$E_{max} = hv - \phi_o$$

If an electron absorbs 2 photons each of frequency v , what will be the maximum energy for emitted electron?

(ii) Why is this fact not taken into consideration in our discussion of the stopping potential?

Q33. $_2He^3$ and 1 He^3 nucleii have the same mass number. Do they have same binding energy? Explain it.

Q34. With the help of circuit diagram describe the use of a zener diode as a voltage regulator.

SECTION –D

Q35. (A) Derive a formula for the capacitance of a parallel plate capacitor when a dielectric slab of thickness t is introduced between the plates?

(b) Two parallel plate capacitor when connected in series give an equivalent capacitance 3μF and when connected in parallel they give an equivalent capacitance 16μF. Calculate the value of individual capacitance of the capacitors?

OR

State Gauss' law in electrostatics. Use this law to determine the electric field at a point due to a tin plane sheet of charge density 'σ'. Calculate the field at the midpoint between two thin sheets of equal and opposite charge densities separated by a distance'd'?

Q36. (a) Derive an expression for the importance of a series LCR-circuit connected across an a.c. source.

(B) Draw a graph showing the variation of the current through the circuit with the frequency of ac source.

(c) What is the impedance of this circuit at resonance?

OR

(A) Define self-inductance of a solenoid and write its SI unit.
(B) Derive an expression for the self-inductance a long air cored solenoid of length l, cross-sectional area A having the number of turns N.

Q37. (a) What is interference of light? Write two essential conditions for sustained interference pattern to be produced on the screen.

(b) Draw a graph showing the variation of the resultant intensity in the interference pattern against position x on the screen.

(c) What is the effect on the interference pattern in Young's double slit experiment when:

(i) Screen is moved closer to the plane of the slits?

(ii) Separation between the two slits is increased? Explain your answer in each case.

OR

(a) What is the diffraction of light? Draw a graph showing the variation of the intensity with angle in a single slit diffraction experiment.

(b) Write one feature which distinguishes the observed pattern from the double slit interference pattern.

(c) How would the diffraction pattern of single slit be affected when:

(i) The width of the slit is decreased?

(ii) The monochromatic light is replaced by a source of white light?

MARKING SCHEME
SAMPLLE PAPER-4

Q .NO.	**VALUE POINTS**	**MARKS**
1-20	1-d 2-a 3-a 4-a 5-b 6-b 7-a 8-b 9-d 10-b 11-d 12-a 13-c 14-d 15-d 16-d 17-a 18-c 19-a 20-c	1 x 20

21.	Unit –Ampere/meter^2 Dimension – AL^{-2}	1 1
22.	Statement	2
23.	Two characteristics	2
24.	Resonance condition Frequency of microwave matches With the frequency of water molecule	1 1
25.	Formula – n = real depth/apparent depth Graph Explanation	1 1
26.	All the electrons that absorbs a photon does not come out as photoelectron OR $\lambda = h/mu$ $\rho \alpha 1/\lambda$ result $E= hc/\lambda$ Calculations and result – 2.06	 ½ ½ 1
Q27.	So any diode D2 will detect the radiate Calculation of electric field at different point I, ii, iii, iv	 ½ ½
Q28.	$R_4 < R_3$, $R_2 < R_1$ OR	1+1+1
Q29.	Not necessarily formula for I and v Explanation Formula $1/f = (n_2/n_1 -1)(1/R_1 – 1/R_2)$ Calculations and result n= 3/2 = 1.5	

Q30.	$P_c = p_A + p_B$ $h/\lambda_c = h/\lambda_A + h/\lambda_B$ E= h/ρ $1/\lambda_c = 1/\lambda_A + 1/\lambda_B$ $\lambda_c = \lambda_B . \lambda_A / \lambda_a + \lambda_B$	½ + ½ + ½ 1 ½ 1 2
Q31.	i. Here it is given that an electron absorb two photons each of frequency v then $v^{/}=2v$ where $v^{/}$ is the frequency of emitted electron. $E^{/}=2hv-\phi_0$ ii. The probability of absorbing two photons by the same electron is very low. Hence such emission will be negligible.	1 ½ + ½ 1
Q32.	Nuclei 2 He^3 and 1 He^3 have same mass number but 2 He^3 has two protons and one neutron. 1 $He^{3\prime}$has one proton and two neutron. The repulsive force between proton is missing in 1 He^3 so the B.E. of 1 He^3 is greater than that of 2 He^3	3
Q33.	Circuit diagram explanation derivation find the capacitance in the presence of a dielectric medium solving the numerical with right formula to get two answer 12μF and 4μF OR Gauss law statement Application to find E Finding field between the two thin sheet	 1 2 1 2
Q34.	To derive the formula for the impedance	
Q35.	Graph Impedance at resonance	1 2

		2
	OR	
		3
	Definition unit	
	Diagram	1
	Derivation	1
	Definition condition graph	
	Reasons for two questions	
		1
	OR	1
		3
Q36.	Definition , graph,one feature	
	Reasons for two questions	
	a)Definition-1, Conditions-1, b) Graph-1	
	c) For each correct Answer-1 mark each	1 +1+1+2
Q37.	OR	
	a) Definition-1 ,Graph-1 b) Difference-1	
	c) For each correct Answer-1 mark each	1 + 1+ 1+ 2

KENDRIYA VIDYALAYA SANGATHAN BHUBANESWAR REGION

PHYSICS MODEL QUESTION PAPER-5 2019-20

CLASS XII **PHYSICS**

MAX MARKS: 70 **TIME: 3Hrs.**

BLUE PRINT

S.NO	UNIT	VSA (1 Mark)	SA (I) (2 Marks)	SA (II) (3 Marks)	LA (5 Marks)	TOTAL
1.	Electrostatics	1(3)		3(1)		16(10)
2.	Current Electricity	1(3)	2(2)	3(1)		

3.	**Magnetic Effects Of Current and Magnetism**	**1(2)**		**3(1)**	**5(1)**	**17(8)**
4.	**Electromagnetic Induction and AC**	**1(2)**	**2(1)**	**3(1)**		
5.	**Electromagnetic Waves**	**1(3)**	**2(1)**			**18(10)**
6.	**Optics**	**1(3)**	**2(1)**	**3(1)**	**5(1)**	
7.	**Dual Nature of Matter and Radiation**	**1(2)**	**2(1)**	**3(1)**		**12(7)**
8.	**Atoms and Nuclei**	**1(2)**		**3(1)**		
9.	**Electronic Devices**		**2(1)**		**5(1)**	**07(2)**
	Total	**20×1=20**	**7×2=12**	**7×3=21**	**3×5=15**	**70(37)**

KENDRIYA VIDYALAYA SANGATHAN BHUBANESWAR REGION

MODEL QUESTION PAPER –5 (2019-20)

CLASS XII PHYSICS MAX MARKS: 70 TIME : 3Hrs.

General Instructions:

1. All questions are compulsory. There are 37 questions in all.
2. This question paper has four sections: Section A, Section B, Section C and Section D.

3. Section A contains TWENTY questions of one mark each, Section B contains SEVEN questions of two marks each, Section C contains SEVEN questions of three marks each, and Section D contains three questions of five marks each.

4. There is no overall choice. However, internal choices have been provided in eight questions of one mark, two questions of two marks, two questions of three marks and three questions of five marks.

You have to attempt only one of the choices in such questions.

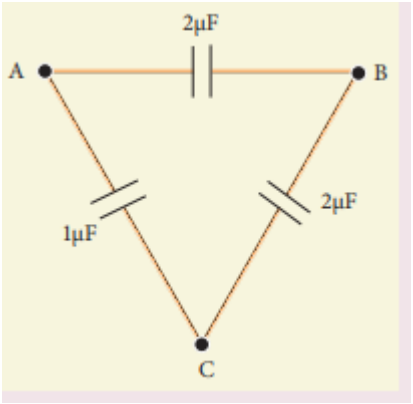
5. You may use the following values of physical constants wherever necessary

$c = 3 \times 10^8$ m/s $h = 6.63 \times 10^{-34}$ Js $e = 1.6 \times 10^{-19}$ C $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}

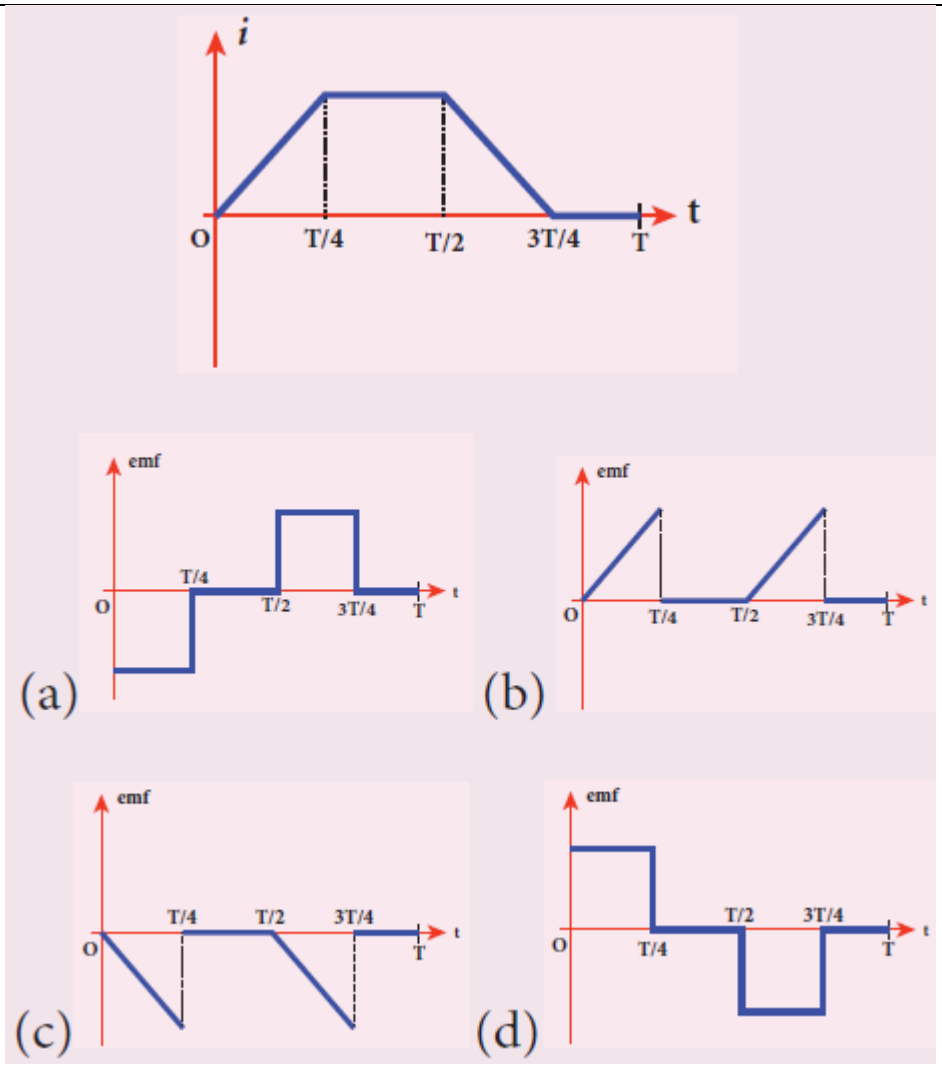
$\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2} $m_e = 9.1 \times 10^{-31}$ kg mass of neutron $= 1.675 \times 10^{-27}$ kg

mass of proton $= 1.673 \times 10^{-27}$ kg Avogadro's number $= 6.023 \times 10^{23}$ per gram mole

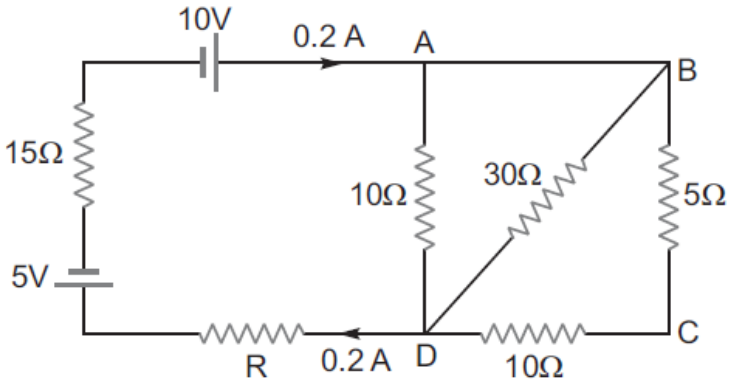
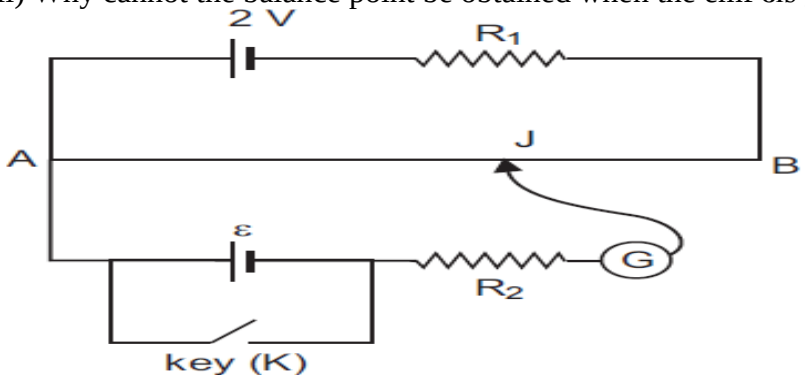
Boltzmann constant $= 1.38 \times 10^{-23}$ JK^{-1}

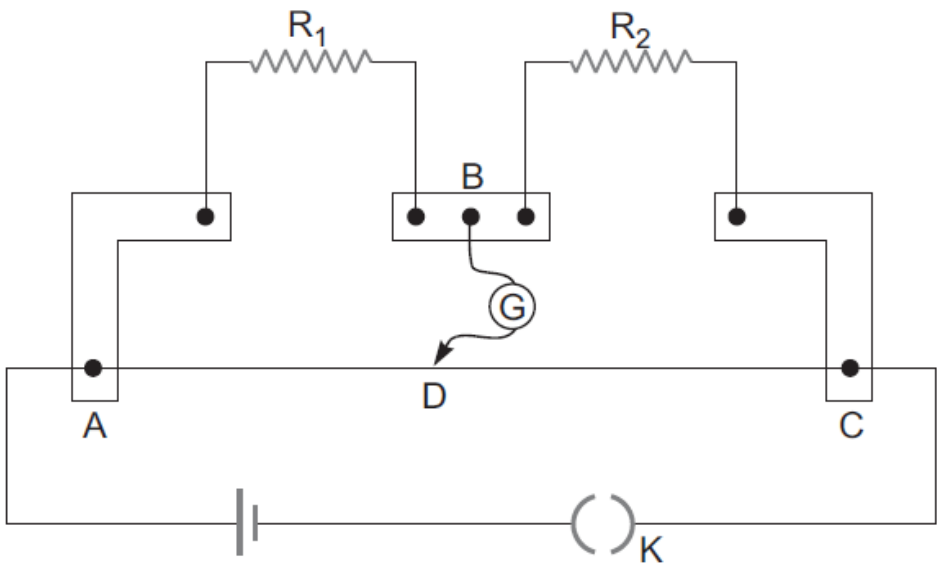
	SECTION A	
1	A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences (a) only a net force (b) only a torque (c) both a net force and torque (d) neither a net force nor a torque	1
2	If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion. (a) Q remains the same, C is doubled (b) Q is doubled, C doubled (c) C remains same, Q doubled(d) Both Q and C remain same OR Three capacitors are connected in triangle as shown in the figure. The equivalent capacitance between the points A and C is  (a) 1μF (b) 2 μF (c) 3 μF (d) 1/4μF	1
3	The work done in moving 500 μC charge between two points on equipotential surface is (a) zero (b) finite positive (c) finite negative (d) infinite	1
4	A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of a) each of them increases b) each of them decreasesc) copper increases and germanium decreases d) copper decreases and germanium increases	1

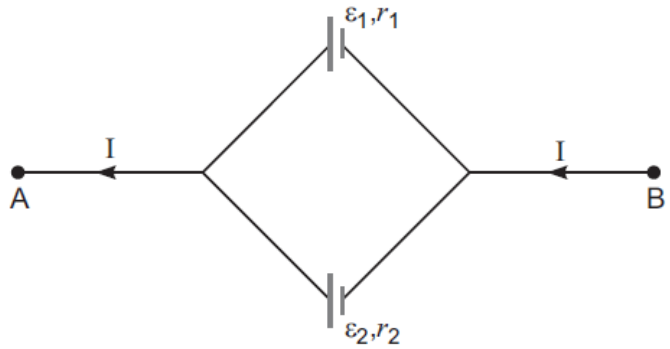
5	A carbon resistor of (47 ± 4.7) k Ω to be marked with rings of different colours for its identification. The colour code sequence will be a) Yellow – Green – Violet – Gold b) Yellow – Violet – Orange – Silver c) Violet – Yellow – Orange – Silver d) Green – Orange – Violet - Gold	1
6	Kirchhoff 's junction rule is a reflection of (a) conservation of current density vector.(b) conservation of charge.(c) the fact that the momentum with which a charged particleapproaches a junction is unchanged (as a vector) as thecharged particle leaves the junction.(d) the fact that there is no accumulation of charges at a junction. OR Two cells of emf's approximately 5V and 10V are to be accuratelycompared using a potentiometer of length 400cm. (a) The battery that runs the potentiometer should have voltage of 8V.(b) The battery of potentiometer can have a voltage of 15V and *R*adjusted so that the potential drop across the wire slightlyexceeds 10V.(c) The first portion of 50 cm of wire itself should have a potentialdrop of 10V.(d) Potentiometer is usually used for comparing resistances and not voltages.	1
7	Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is a square. They are placed in a uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque? (a) circle (b) semi-circle (c) square (d) all of them OR A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is (a) 1.0 amp – m^2 (b) 1.2 amp – m^2 (c) 0.5 amp – m^2 (d) 0.8 amp – m^2	1
8	The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place? (a) 30^o (b) 45^o(c) 60^o (d) 90^o	1
9	In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6A, then that in the secondary coil is (a) 2 A (b) 18 A (c) 12 A (d) 1 A	1
10	The current *i*flowing in a coil varies with time as shown in the figure. The variation of induced emf with time would be	1

	 OR In a series RL circuit, the resistance and inductive reactance are the same. Then the phase difference between the voltage and current in the circuit is (a) π/6 (b) π/2 (c)π/4 (d) zero	
11	Out of the following options which one can be used to produce a propagating electromagnetic wave? (A) A chargeless particle (B) An accelerating charge(C) A charge moving at constant velocity(D) A stationary charge OR The electric and magnetic field of an electromagnetic wave are (A) in opposite phase and perpendicular to each other (B) in opposite phase and parallel to each other (C) in phase and perpendicular to each other (D) in phase and parallel to each other.	1
12	The electric field of an electromagnetic wave in free space is given by $\vec{E} = 10\cos(10^7 t + kx)\hat{j}$ V/m ,	1

	where *t* and *x* are in seconds and meters respectively. It can be inferred that (i) The wavelength λ is 188.4 m (ii) The wave number *k* is 0.33 rad/m (iii) The wave amplitude is 10 V/m (iv) The wave is propagating along +*x* direction Which one of the following pairs of statements is correct? (a) iii & iv (b) i& ii (c) ii & iii (d) i and iii	
13	Arrange the following electromagnetic radiations in the order of increasing energy: A:Blue lightB : Yellow lightC : X-rayD : Radiowave (a)A, B, D, C(b) C, A, B, D(c) B, A, D, C(d) D, B, A, C	1
14	A thin double convex lens has radii of curvature each of magnitude 40 cm and is made of glass with refractive index 1.65. Its focal length is nearly (a) 20 cm (b) 31 cm (c) 35 cm (d) 50 cm	1
15	On a glass plate a light wave is incident at an angle of 60^o. If the reflected and the refractedwaves are mutually perpendicular, the refractive index of material is (a)$\frac{\sqrt{3}}{2}$ (b)$\sqrt{3}$ (c) 3/2 (d)$\frac{1}{\sqrt{3}}$ OR A convex mirror of focal length 10 cm is placed in water. The refractive index of water is 4/3.What will be the focal length of the mirror in water (a) 10 cm (b) 40/3 cm (c) 30/4 cm (d) None ofthese	1
16	Name the wave phenomena which prove the transverse nature of light WAVES. (a) Interference of light (b) Diffraction of light (c) Polarization of light (d) Refraction of light	1
17	The kinetic energy of electron and proton is 10^{-32}J . Then the relation between their de-Brogliewavelengths is (a) $\lambda p < \lambda e$(b) $\lambda p > \lambda e$(c) $\lambda p = \lambda e$(d) $\lambda p = 2\lambda e$	1
18	When yellow light incident on a surface no electrons are emitted while green light can emit. If red light is incident onthe surface then (a) No electrons are emitted (b) Photons are emitted(c) Electrons of higher energy are emitted (d) Electrons of lower energy are emitted OR The work functions of metals A and B are in the ratio 1 : 2. If light of frequencies f and 2f are incident on the surfacesof A and B respectively, the ratio of the maximum kinetic energies of photoelectrons emitted is (f is greater thanthreshold frequency of A, 2f is greater than threshold frequency of B) (a) 1 : 1 (b) 1 : 2 (c) 1 : 3 (d) 1 : 4	1
19	The ratio of areas within the electron orbits for the first excited state to the ground state for hydrogenatom is (a) 16 : 1 (b) 18 : 1 (c) 4 : 1 (d) 2 : 1 OR The first member of the Paschen series in hydrogen spectrum is of wavelength 18,800 Å. The shortwavelength limit of Paschen series is (a) 1215 Å (b) 6560 Å (c) 8225 Å (d) 12850 Å	1

20	The ratio of radii of nuclei $^{27}_{13}Al$ and $^{125}_{52}Te$ is approximately (a) 6 : 10 (b) 13 : 52 (c) 40 : 177 (d) 14 : 7	1
	SECTION B	
21	Calculate the value of the resistance *R* in the circuit shown in the figure so that the current in thecircuit is 0.2 *A*.  OR A 9 V battery is connected in series with a resistor .The terminal voltage is found to be 8 V.Current through the circuit is measured as 5 A. What is the internal resistance of the battery?	2
22	Figure shows the circuit diagram of a potentiometerfor determining the emf 'ε' of a cell of negligibleinternal resistance. (i) What is the purpose of using high resistance R_2 ? (ii) Why cannot the balance point be obtained when the emf εis greater than 2 V?  OR In the meterbridge experimental set up, shown in the figure, the null point 'D' is obtained at adistance of 40 cm from end A of the meterbridge wire. If a resistance of 10 Ω is connected inseries with R_1, null point is obtained at AD = 60 cm. Calculate the value of R_1 and R_2.	2

		
23	Draw a plot showing the variation of the current I as a function of angular frequency 'ω' of the appliedac source for the two cases of a series combination of (i) inductance L_1, capacitance C_1 and resistanceR_1 and (ii) inductance L_2, capacitance C_2 and resistance R_2 where $R_2 > R_1$.Write the relation between L_1, C_1 and L_2,C_2 at resonance.	2
24	(i) Thin ozone layer on top of stratosphere is crucial for human survival. Why? (ii) Why are infrared waves often called as heat waves? Give their one application.	2
25	A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minimum is adistance of 2.5 mm away from the centre. Find the width of the slit.	2
26	The wavelength λ of a photon and a de-Broglie wavelength of an electron have same value. Show that the energy of the photon is $\frac{2\lambda mc}{h}$ times the kinetic energy of the electrons, where m,e and h have their usual meaning.	2
27	Using the Band diagram, Explain, how will you differentiate the substance into a conductor and insulator	2
	SECTION C	
28	Using Gauss' lawdeduce the expression for the electric field due to a uniformly charged sphericalconducting shell of radius R at a point (i) outside and (ii) inside the shell.	3
29	Two cells of emfs ε_1, ε_2 and internal resistance $r_1$and r_2 respectively are connected in parallel asshown in the figure. Deduce the expressions for (*i*) the equivalent e.m.f. of the combination,(*ii*) the equivalent resistance of the combination.	3

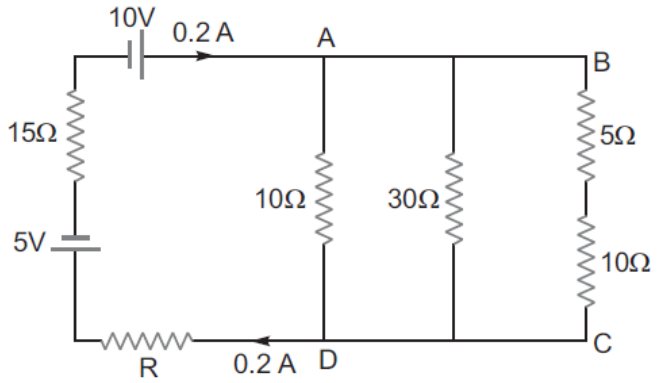
		
30	(*a*) With the help of a diagram, explain the principle and working of a moving coil Galvanometer. (*b*) What is the importance of a radial magnetic field and how is it produced **OR** (*a*) Derive an expression for the force between two long parallel current carrying conductors. (*b*) Use this expression to define S. I. unit of current.	3
31	State the working of a.c. generator with the help of a labelled diagram. The coil of an a.c. generator having N turns, each of area A, is rotated with a constant angularvelocity ω. Deduce the expression for the alternating e.m.f. generated in the coil.	3
32	Draw a labelled ray diagram to show the image formation in a refracting type astronomicaltelescope in the normal adjustment position. Write two drawbacks of refracting typetelescopes. OR A ray of monochromatic light is incident on one of the faces of an equilateral triangular prismof refracting angle A. Trace the path of ray passing through the prism. Hence, derive anexpression for the refractive index of the material of the prism in terms of the angle of minimumdeviation and its refracting angle.	3
33	Write two characteristic features observed in photoelectric effect which support the photon pictureof electromagnetic radiation. Draw a graph between the frequency of incident radiation (v) and the maximum kinetic energy ofthe electrons emitted from the surface of a photosensitive material. State clearly how this graphcan be used to determine (*i*) Planck's constant and (*ii*) work function of the material.	3
34	Draw a plot of the binding energy per nucleon as a function of mass number for a large number ofnuclei. Explain the energy release in the process of nuclear fission from the above plot. Write a typicalnuclear reaction in which a large amount of energy is released in the process of nuclear fission.	3
	SECTION D	
35	(a) StateBiot-Savart's law, and represent it in vector form (b) What does a toroid consist of ? Find out the expression for the magnetic field inside a toroid for Nturns of the coil having the average radius r and carrying a current I. Show that the magnetic fieldin the open space inside and exterior to the toroid is zero.	5

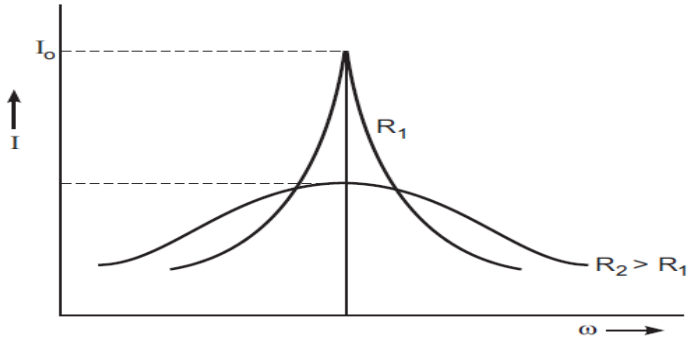
	OR (a) Draw a schematic sketch of a cyclotron. Explain clearly the role of crossed electric and magneticfield in accelerating the charge. Hence derive the expression for the kinetic energy acquired bythe particles. (b) An α–particle and a proton are released from the centre of the cyclotron and made to accelerate.(i) Can both be accelerated at the same cyclotron frequency? Give reason to justify youranswer.(ii) When they are accelerated in turn, which of the two will have higher velocity at theexit slit of the dees?	
36	(*a*) (*i*) 'Two independent monochromatic sources of light cannot produce a sustained interferencepattern'. Give reason. (*ii*) Light waves each of amplitude "*a*" and frequency "ω", emanating from two coherent light sources superpose at a point. If the displacements due to these waves is given by $y_1 = a \sin\omega t$ and $y_2 = a \sin(\omega t + \varphi)$ where φ is the phase difference between the two, Obtain the expression for the resultant intensity at the point. (*b*) In Young's double slit experiment, using monochromatic light of wavelength λ, the intensity oflight at a point on the screen where path difference is λ, is *K* units. Find out the intensity of light ata point where path difference is λ/3. **OR** (*a*) How does one demonstrate, using a suitable diagram, that unpolarised light when passed througha polaroid gets polarised? (*b*) A beam of unpolarised light is incident on a glass-air interface. Show, using a suitable raydiagram, that light reflected from the interface is totally polarised, when n = tan i_B, where n isthe refractive index of glass with respect to air and $i_B$is the Brewster's angle.	5
37	(i) Explain briefly, with the help of a circuit diagram, how a *p*-*n* junction diode works as afull wave rectifier. (ii) Why photodiode is always used in reverse bias mode. (iii) Write any two advantages of LED **OR** (i) How is a zener diode fabricated so as to make it a special purpose diode? Draw *I*-*V* characteristics of zener diode and explain the significance of breakdown voltage. (ii) Explain briefly, with the help of a circuit diagram, how a *p*-*n* junction diode works as ahalf wave rectifier.	5

KENDRIYA VIDYALAYA SANGATHAN BHUBANESWAR REGION

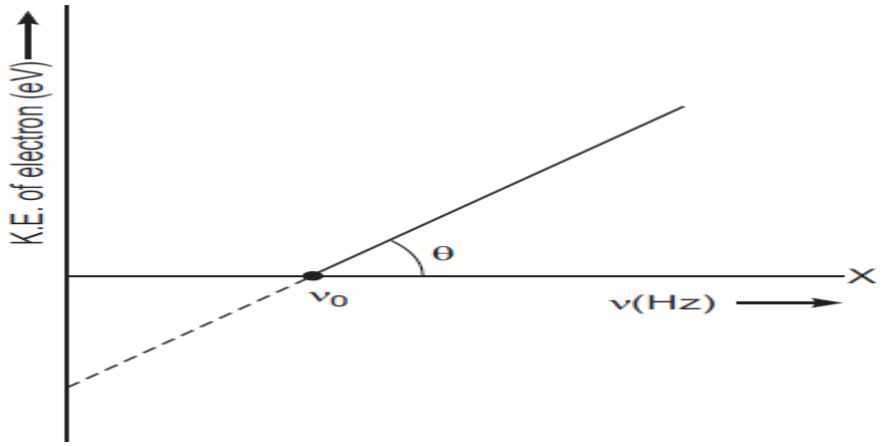
MODEL QUESTION PAPER –5 (2019-20)

MARKING SCHEME

Q No	SECTION A	MARKS
1	d	1
2	c or b	1
3	a	1
4	d	1
5	b	1
6	d or b	1
7	a or c	1
8	b	1
9	a	1
10	a or c	1
11	b or c	1
12	d	1
13	d	1
14	b	1
15	b or a	1
16	c	1
17	a	1
18	a or b	1
19	a or c	1
20	a	1
	SECTION B	
21	The equivalent diagram of the given electrical circuit is as follows.  	1

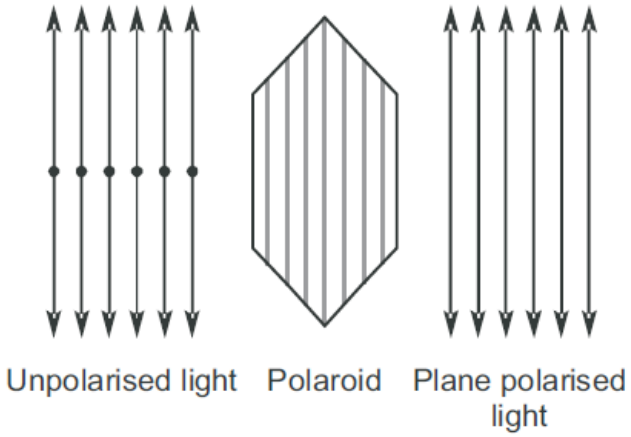
	The effective resistance between A and D $\frac{1}{R'}=\frac{1}{10}+\frac{1}{30}+\frac{1}{15}=\frac{3+1+2}{30}$ $\Rightarrow \quad R'=5\Omega$ Applying Kirchhoff Law, to find unknown R. $5 \times 0.2 + R \times 0.2 + 15 \times 0.2 = + 10 - 5$ $1+\frac{R}{5}+3=+5 \quad \Rightarrow \quad R=5\Omega$ OR EMF of the cell $\varepsilon = V + Ir$ $r = (\varepsilon - V)/I$ $= (9 - 8)/5$ $= 0.2\ \Omega$	1 1 1
22	(i) (i) The purpose of high resistance R_2 is to reduce the current through thegalvanometer. When jockey is far from balance point, this saves the galvanometer and the cell (of emf ε) from being damaged. (ii) The balance point is not obtained because maximum emf across potentiometerwire is 2 V. OR $R_1 / R_2 = 2/3$ $(R_1+10)/R_2 = 3/2$ By solving $R_1 = 8$ ohm $\quad R_2 = 12$ ohm	1 1 1 1
23	 $\omega_r = \frac{1}{\sqrt{L_1C_1}} = \frac{1}{\sqrt{L_2C_2}}$ $\Rightarrow L_1C_1 = L_2C_2 \Rightarrow \frac{L_1}{L_2} = \frac{C_2}{C_1}$	1 1
24	(i) Ozone layer absorbs the ultraviolet radiations from the sun and prevents it from reaching theearth's surface.	1

	(ii) Infrared waves are called heat waves because water molecules present in the materials readilyabsorb the infra red rays get heated up. **Application:** They are used in green houses to warm the plants or any one application	½ ½
25	The distance of nth bright fringe from central fringe is, $y_n = \frac{n\lambda D}{d}$ Width $d = \frac{n\lambda D}{y_n}$ $= \frac{1 \times 500 \times 10^{-9} \times 1}{2.5 \times 10^{-3}} = 2 \times 10^{-4}$ m = 0.2 mr	1 1
26	Given wavelength of photon = de -broglie wavelength of electror For photon, the kinetic energy is same as its energy and is **Ep = hc/λ**.....eq1 For electron, the de-broglie wavelength is given as, λ = h/p where p is the momentum of electron, => p = h/λ Kinetic energy in terms of momentum can be written as $KE = p^2/2m$ $=> KE = (h/\lambda)^2/2m$ $=> \mathbf{KE = h^2/2m\lambda^2}$.....eqn2 dividing eqn 1 by eqn2 we get $Ep/KE = (hc/\lambda)/h^2/2m\lambda^2$ => Ep/KE = (2λmc/h) **=> Ep = (2λmc/h)KE** **which is the required expression.**	1 1
27	Band diagram and explanation for conductor Band diagram and explanation for insulator	1 1
	SECTION C	

28	Diagram of charged shell derivation outside shell + inside shell	1 1+1
29	Derivation of expressions for (*i*) the equivalent e.m.f. of the combination, (*ii*) the equivalent resistance of the combination	 1 ½ 1 ½
30	Principle of moving coil galvanometer, diagram, working importance of radial field and production OR Diagram of parallel wires Derivation definition of 1A	2 1 ½ 1 ½ 1
31	Diagram of a.c.generator working derivation of expression	1 1 1
32	Refracting type telescope diagram drawbacks, any two OR Prism Ray diagram Derivation	2 1 1 2
33	1) The photoelectric current is linearly proportional to intensity of incident light. It is because , the intensity of light is proportional to the number of photons incident per sec per unit area. 2) Photoelectric effect is a instantaneous process. It is because, photo electrons are emitted due to one to one interaction of photon and electron. So electrons are emitted without any time delay.  Acc to Einstein's photoelectric equation, $\frac{1}{2} mv^2 = h\nu - \varphi$ $y = mx + c$ Slope = h Work function = c	½ each 1 1
34	plot of the binding energy per nucleon as a function of mass number for a large number ofnuclei	1 1

	Explanation for energy release Nuclear fission reaction (any one)	1
	SECTION D	
35	Biot- Savart law statement and equation in vector form A long solenoid on bending in the form of closed ring is called a toroidal solenoid. Diagram of toroid Derivation of B at different regions OR Diagram of cyclotron **Role of electric field** (i) Electric field accelerates the charge particle passing through the gap withthe help of electric oscillator. (ii) Electric oscillator imparts the energy to charged particle till it comes out from the exit slit. **Role of magnetic field** As the accelerated charge particle enters normally to the uniform magnetic field, it exerts a magnetic force in the form of centripetal force and charge particle moves on a semicircular path ofincreasing radii in each dee ($D1$ or $D2$) so that the particle can cross the electric field many times to get accelerated. Derivation of KE	2 ½ ½ 2 1 ½ ½ 1 1 1

	(b) (i) No, from equation (1) $v=\frac{qBr}{m}$ $\Rightarrow v=r\,\omega=\frac{qBr}{m}$ $\Rightarrow 2\pi\nu=\frac{qB}{m}$ $\Rightarrow \nu=\frac{qB}{2\pi m}$ Cyclotron frequency depends on $\left(\frac{q}{m}\right)$ ratio, since $\left(\frac{q}{m}\right)_{\alpha}<\left(\frac{q}{m}\right)_{p}$ or $\nu_{\alpha}<\nu_{p}$ (ii) From equation (2), kinetic energy $K=\frac{q^2B^2r^2}{2m}$ $\left(\frac{q^2}{m}\right)_{\text{proton}}>\left(\frac{q^2}{m}\right)_{\alpha}$ So, proton acquires higher velocity at the exit slit for fixed radi radius of the dee.	
36	The light waves, originating from two independent monochromatic sources, will not havea constant phase difference. Therefore, these sources will not be coherent and thereforewould not produce a sustained interference pattern.	1
	Derivation of resultant intensity $I = 4a^2\cos^2\frac{\varphi}{2}$ A path difference of λ, corresponds to a phase differenc $\therefore$ Intensity, $I = 4a^2$ or $a^2=\frac{I}{4}$ A path difference of $\frac{\lambda}{3}$, corresponds to a phase differen $\therefore$ Intensity $= 4\times\frac{I}{4}.\cos^2\frac{2\pi}{3}=\frac{I}{4}$	2 1 1
	OR A polaroid consists of long chain molecules aligned in a particular	

	direction. The electric vectors along the direction of the aligned molecules get absorbed. So, when an unpolarised light falls on a polaroid, it lets only those of its electric vectors that are oscillating along a direction perpendicular to its aligned molecules to pass through it. The incident light thus gets linearly polarised.  Brewster's law derivation + diagram	2 2+ 1
37	(i) *p-n* junction diode works as a full wave rectifier + CIRCUIT (ii) photodiode is always used in reverse bias mode – REASON (iii) any two advantages of LED OR Zener diode is made with heavily doped semiconductors. V-I graph From the graph, at breakdown voltage , for different values of current through the Zener diode, voltage across the diode remains same. Half Wave Rectifier circuit diagram working input and output waveform diagrams	3 1 1 ½ 1 ½ 1 1 1