Class: XIISESSION:2023-2024

HBSE SAMPLEQUESTIONPAPER(THEORY)

SUBJECT:PHYSICS

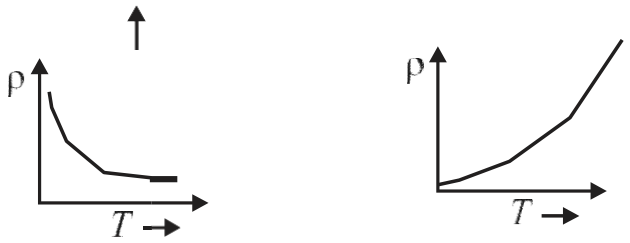
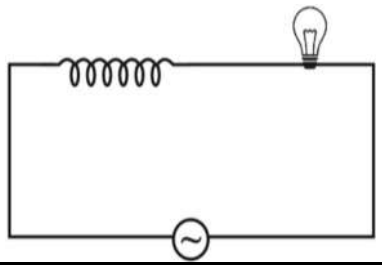
MaximumMarks:70Marks **TimeAllowed**:3hours.

GeneralInstructions:

(1) There are35 questionsin all. Allquestionsarecompulsory
(2) This question paper has five sections: Section A, Section B, Section C, SectionDandSection E.Allthese Sections arecompulsory.
(3) Section A contains eighteen MCQ of1 mark each, Section B contains sevenquestions of two marks each, Section C contains five questions of three markseach, section D contains three long questions of five marks each and Section Econtainstwocase studybased questions of4marks each.
(4) There is no overall choice. However, an internal choice has been provided insection B, C, D and E. You have to attempt only one of the choices in suchquestions.
5.Useofcalculatorsis not allowed.

SECTIONA

Q. NO.		MARKS
1	**The electric potential on the axis of an electric dipole at adistance‘rfrom it’scentre is V. Then the potential at a pointatthesamedistanceonits equatorial linewill be** (i) 2V (ii) -V (iii) V/2 (iv) Zero	1
2	**Resistanceof conductordoes notdependon** (i) Length ofconductor (ii) Natureofmaterial (iii) Radiusofcross sectionofconductor (iv) Potentialdifferenceapplied acrosstheconductor	1

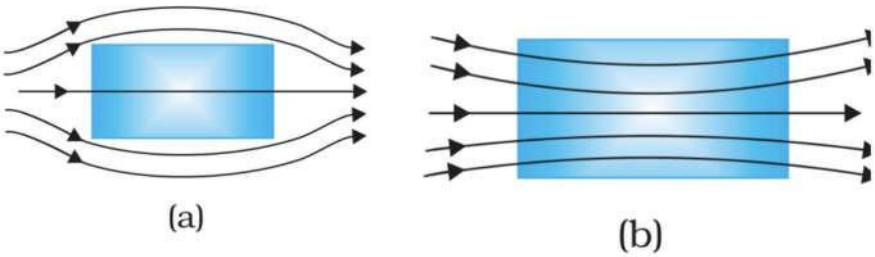
3	**The temperature (T) dependence of resistivity of materials Aand material B is represented by fig(i) and fig (ii) respectively.IdentifymaterialAandmaterial B.**  fig. (i) fig. (ii) (i) material Aiscopperandmaterial Bisgermanium (ii) material Aisgermaniumandmaterial Biscopper (iii) material Aisnichrome and materialBis germanium material Aiscopperandmaterial Bisnichrome	1
4	**Wheatstonebridgecannot beused formeasuring ofvery …….resistances** (i) high (ii) low (iii) lowor high (iv) mediumvalue	1
5	**If the magnetizing field on a ferromagnetic materialisincreased,its permeability** (i) decreases (ii) increases (iii) remainsunchanged (iv) firstdecreasesandthen increases	1
6	**An iron cored coil is connected in series with an electric bulbwith an AC source as shown in figure. When iron piece istakenout ofthecoil,thebrightnessof thebulbwill** **(i)** decrease **(ii)** increase **(iii)** remainunaffected (iv) fluctuate 	1

7	**A ray of light passing from air through an equilateral glassprism undergoes minimum deviation when the angle ofincidence is ¾ of the angle of prism. speed of light in theprismis.** i) c ii) c/2 iii) c/4 **(iv)** none	1
8	**Which of the following statement is NOT true about thepropertiesof electromagneticwaves?** **(**I)These waves do not require any material medium for theirpropagation (ii) Both electric and magnetic field vectors attain the maxima andminimaat thesametime (iii) The energy in electromagnetic wave is divided equally betweenelectricand magneticfields iv) Both electricand magnetic field vectors areparalleltoeachother	1
9	**In two positions convex lens produces magnified image of givenobject.Thepositions are** i) At f,at2f ii) Betweenf and2f,between opticalcenter andf iii) Beyond2f, betweenc and f iv) At2f,betweenopticalcentreandf	1
10	**If Young's double slit experiment is immersed in water, thenfringewidth** (i) decreases (ii) increases(iii)remainsame (iv)none	1
11	**The work function for a metal surface is 4.14 eV. The thresholdwavelengthfor thismetal surfaceis:** (i) 4125Å (ii)2062.5Å (iii) 3000Å (iv) 6000Å	1

12	**The radius of the inner most electron orbit of a hydrogen atom is5.3×10^{-11}m.Theradiusof then=3orbitis** i) $1.01x1^{-10}$m ii) $1.59X10^{-1}$m iii) $2.12x10^{-10}$ m iv) $4.77X10^{-10}$m	1
13	**Whichof thefollowing statementsaboutnuclear forces is nottrue?** **(i)** The nuclear force between two nucleons falls rapidly to zero astheirdistanceis more than afewfemtometers. **(ii)** Thenuclearforceismuchweakerthan theCoulomb force. **(iii)**The force is attractive for distances larger than 0.8 fm andrepulsiveif theyareseparated bydistancesless than 0.8 fm. **(iv)**Then nuclear force between neutron-neutron, proton-neutron andproton-protonis approximatelythesame.	1
14	**Poweroflens is 10 diopters,which of following is correct** (i) Convexlensoffocallength10metre (ii) Convex lens of focallength10 cm (iii) Concavelensoffocallength10metre (iv) Concave lens of focallength10cm	1
15-18 Twostatementsaregiven-onelabeled Assertion(A)and the other labeled Reason(R). Select the correct answer tothesequestions fromthecodes (a),(b),(c) and(d)asgivenbelow. **a) BothAand Rare trueandRisthecorrectexplanation of A** **b) Both A and R are true and R is NOT the correct explanation ofA** **c) A is true but R is false** **d) A is false and R is also false** **15. Assertion : A p-type semiconductors is a positive type crystal.** **Reason : A p- type semiconductor is an uncharged crystal.**		1

16.	**ASSERTION(A):** Theelectrical conductivityof asemiconductorincreasesondoping. **REASON (R) :** Dopingalways increases the number of electrons in thesemiconductor.	
17	**Twostatementsaregiven-onelabeled Assertion (A) and the other labelled Reason (R). Select thecorrectanswer to these questions fromthecodes (a),(b),(c)and (d)asgivenbelow.** **a)** Both Aand Raretrueand Risthe correctexplanation ofA **b)** Both Aand Raretrueand Ris NOTthe correctexplanationofA **c)** Aistruebut Ris false **d)** Aisfalseand Ris also false **ASSERTION:** In an interference pattern observed in Young's double slitexperiment, if the separation (d) between coherent sources as well asthedistance (D) of the screen from the coherent sources both are reduced to1/3rd.,thennewfringewidth remainsthe same**.** **REASON:** Fringewidthisproportionalto(d/D)**.**	1
18	**Two statements are given-one labeled Assertion (A) and theother labelled Reason (R). Select the correct answer to thesequestions from the codes (a), (b), (c) and (d) as given below.**a)BothAandRare true andRisthecorrect explanationof A b) Both Aand RaretrueandRisNOTthecorrect explanation ofA c) Aistruebut Ris false d) Ais falseand Risalso false **Assertion(A):** The photoelectrons produced by a mono chromatic light beamincidenton ametalsurfacehaveaspreadintheirkineticenergies. **Reason(R):** The energy of electrons emitted from inside the metal surface, islostin collision withthe other atoms inthemetal.	1

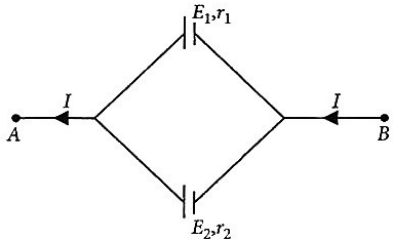
SECTIONB

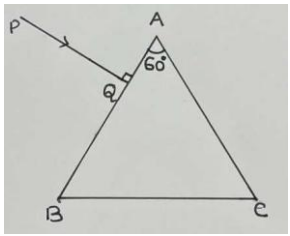
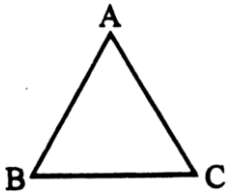
19	Electromagneticwaveswith wavelength (i) λ_1 is suitable for radar systems used in air craftnavigation. (ii) $\lambda_2$isusedtokillgermsinwaterpurifiers. Identify and name the part of the electromagnetic spectrum towhichthese radiations belong.	2
20	A uniform magnetic field gets modified as shown in figurewhentwospecimensAandBareplaced init.  (a) (b) Identifythe specimenAandB.	2
21	State biot savarts law.?OR Stateamperescircuitallaw	2
22	Stateworkingprincipleofmovingcoilgalvanometer?	2
23	A proton, deutron and alpha particle enter with same momentumperpendicular to same magnetic field. What is The ratio of radii ofproton,deutron and alphaparticle	2
24	A narrow slit is illuminated by a parallel beam of monochromaticlight of wavelength λ equal to 6000 Å, separation between the slitis2 cm. whatis the angular width of the central maxima.	2
25.	Define distance of closest approach in Rutherford alpha scatteringexperiment. Writemathematical formula. OR Explain Rutherford alpha scattering experiment.	2

	SECTIONC	
26.	Two large, thin metal plates are parallel and close to each other.On their inner faces, the plates have surface charge densities ofopposite signs and of magnitude$17.7\times10^{-22}C/m^2$. What is electricfieldintensityE: (a) intheouter regionofthefirstplate,and (b) betweentheplates?	3
27	Statelawsofphotoelectric effect?	3
28	Explaintheprocessesofnuclearfissionandnuclearfusionbyusingtheplotofbindingenergypernucleon(BE/A)versusthemassnumberA.	3
29	An a.c. source generating a voltage $\varepsilon = E_0\sin\omega t$ is connected to acapacitor of capacitance C .Find the expression for the current Iflowing through it. Plot a graph of ε and I versus ωt to show thatthecurrent isahead ofthevoltage by$\pi/2$. **OR** An ac voltage $V = V_0\sin\omega t$ is applied across a pure inductor ofinductance*L*. Find an expression for the current *i*, flowing in thecircuit and show mathematically that the current flowing through itlags behind the applied voltage by a phase angle of$\pi/2$..Also drawgraphsof*V*and*I*versus ωtforthecircuit.	3
30.	WriteBohr'spostulatesforthehydrogenatommodel.	

SECTIOND

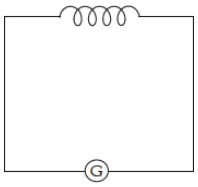
31	What is p n junction diode. Explain the process involved information of p n junction diode with the help of suitablediagram OR Explain principle and working of p n junction diode in fullwave rectifier?	5

32	(a) Explain the term drift velocity of electrons in a conductor.Hence obtain the expression for the current through aconductorin terms ofdrift velocity. (b) Twocellsofemfs $E1$ and$E2$ andinternalresistances $r_1$and$r_2$respectivelyareconnectedinparallel asshown inthefigure. Deducetheexpression forthe (i) Equivalentemfof thecombination (ii) equivalentinternalresistanceofthecombination (iii) potentialdifferencebetweenthe points*A*and*B*.  **OR** (a) State the two Kirchhoff's rules used in thenanalysisofelectriccircuitsandexplainthem . (b) Derivethe equationofthebalanced stateina WheatstonebridgeusingKirchhoff'slaws.	5
33	a) Prove prism formula b) ArayPQisincidentnormallyonthefaceAB ofa	5

	triangularprismofrefractingangle60^0asshowninfigure.The prism is made of a transparent material ofrefractive index2/√3. Trace the path of the ray as it passesthrough the prism. Calculate the angle of emergence andtheangleofdeviation.  **OR** (i) A ray of light incident on face AB of an equilateralglass prism, shows minimum deviation of 30°.Calculatethe speed oflight through theprism. (ii)FindtheangleofincidenceatfaceABsothattheEmerg entraygrazesalong thefaceAC.  	

SECTIONE

34	CaseStudy: Readthefollowing paragraphandanswerthequestions. Smallest charge that can exist in nature is the charge of anelectron. During friction it is only the transfer of electron which makesthe body charged. Hence net charge on any body is an integral multipleofcharge of an electron(1.6x 10^{-19}C)i.e.,q=±ne where r=1,2,3,4…. Hence no body can have a charge represented as 1.8e, 2.7e, 2e/5, etc.Recently, it has been discovered that elementary particles such asprotonsor neutrons are elemental unitscalledquarks **I) Ifachargeonabodyis1nC,thenhowmanyelectronsarepresen t onthebody?** **II) Chargeis scalarorvector ?** **III) Apolythenepiecerubbedwithwoolisfoundtohavea negativechargeof3.2x10^{-7}C.Calculatethenumberofelectronstransferred.** **OR** **What is charge?**	4

35	**Casestudy:ElectromagneticInduction.** **Readthefollowing paragraphandanswerthequestions** When a current I flows through a coil, flux linked with it is φ = LI,whereLis a constant known as selfinductanceof the coil.  Any charge in current sets up an induced emf in the coil. Thus, selfinductance of a coil is the induced emf set up in it when the currentpassingthroughitchangesattheunitrate.Itisameasureoftheoppositi on to the growth or the decay of current flowing through thecoil. Also, value of self inductance depends on the number of turns inthe solenoid, its area of cross-section and the permeability of its corematerial. I) What is self inductance ? II) State the factors on which self inductance of a long solenoid depends? III) What is theinducedemfinacoilof10henryinductanceinwhich currentvaries from9 Ato 4 AIn 0.2 second OR What is Lenz's law ?	4