

Class: XISESSION:2023-2024

HBSE SAMPLEQUESTIONPAPER(THEORY)

SUBJECT:PHYSICS

MaximumMarks:70Marks

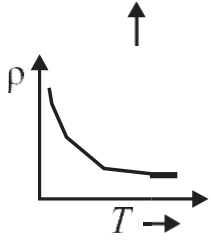
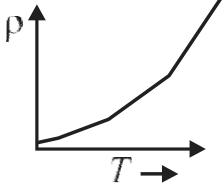
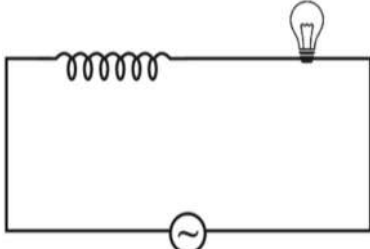
TimeAllowed:3hours.

GeneralInstructions:

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

SECTION A

Q. NO.		MAR KS
1	The electric potential on the axis of an electric dipole at a distance 'r' from its centre is V. Then the potential at a point at the same distance on its equatorial line will be (i) 2V (ii) -V (iii) V/2 (iv) Zero	1
2	Resistance of conductor does not depend on (i) Length of conductor (ii) Nature of material (iii) Radius of cross section of conductor (iv) Potential difference applied across the conductor	1

3	<p>The temperature (T) dependence of resistivity of materials A and material B is represented by fig(i) and fig (ii) respectively. Identify material A and material B.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>fig. (i)</p> </div> <div style="text-align: center;">  <p>fig. (ii)</p> </div> </div> <p>(i) material A is copper and material B is germanium (ii) material A is germanium and material B is copper (iii) material A is nichrome and material B is germanium material A is copper and material B is nichrome</p>	1
4	<p>Wheatstone bridge cannot be used for measuring of everyresistances</p> <p>(i) high (ii) low (iii) lower high (iv) medium value</p>	1
5	<p>If the magnetizing field on a ferromagnetic material is increased, its permeability</p> <p>(i) decreases (ii) increases (iii) remains unchanged (iv) first decreases and then increases</p>	1
6	<p>An iron cored coil is connected in series with an electric bulb with an AC source as shown in figure. When iron piece is taken out of the coil, the brightness of the bulb will</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>(i) decrease (ii) increase (iii) remain unaffected (iv) fluctuate</p> </div> <div style="text-align: center;">  </div> </div>	1

7	<p>A ray of light passing from air through an equilateral glass prism undergoes minimum deviation when the angle of incidence is $\frac{3}{4}$ of the angle of prism. speed of light in the prism is.</p> <p>i) c ii) $c/2$ iii) $c/4$ (iv) none</p>	1
8	<p>Which of the following statement is NOT true about the properties of electromagnetic waves?</p> <p>(I) These waves do not require any material medium for their propagation (ii) Both electric and magnetic field vectors attain the maxima and minima at the same time (iii) The energy in electromagnetic wave is divided equally between electric and magnetic fields iv) Both electric and magnetic field vectors are parallel to each other</p>	1
9	<p>In two positions convex lens produces magnified image of given object. The positions are</p> <p>i) At f, at $2f$ ii) Between f and $2f$, between optical center and f iii) Beyond $2f$, between $2f$ and f iv) At $2f$, between optical center and f</p>	1
10	<p>If Young's double slit experiment is immersed in water, then fringe width</p> <p>(i) decreases (ii) increases (iii) remains same (iv) none</p>	1
11	<p>The work function for a metal surface is 4.14 eV. The threshold wavelength for this metal surface is:</p> <p>(i) 4125 \AA (ii) 2062.5 \AA (iii) 3000 \AA (iv) 6000 \AA</p>	1

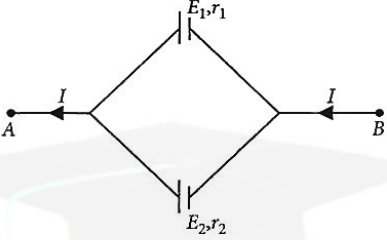
12	<p>The radius of the inner most electron orbit of a hydrogen atom is 5.3×10^{-11} m. The radius of then = 3 orbit is</p> <p>i) 1.01×10^{-10} m</p> <p>ii) 1.59×10^{-11} m</p> <p>iii) 2.12×10^{-10} m</p> <p>iv) 4.77×10^{-10} m</p>	1
13	<p>Which of the following statements about nuclear forces is not true?</p> <p>(i) The nuclear force between two nucleons falls rapidly to zero as the distance is more than a few femtometers.</p> <p>(ii) The nuclear force is much weaker than the Coulomb force.</p> <p>(iii) The force is attractive for distances larger than 0.8 fm and repulsive if they are separated by distances less than 0.8 fm.</p> <p>(iv) The nuclear force between neutron-neutron, proton-neutron and proton-proton is approximately the same.</p>	1
14	<p>Power of lens is 10 diopters, which of following is correct</p> <p>(i) Convex lens of focal length 10 metre</p> <p>(ii) Convex lens of focal length 10 cm</p> <p>(iii) Concave lens of focal length 10 metre</p> <p>(iv) Concave lens of focal length 10 cm</p>	1
<p>15-18 Two statements are given - one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.</p> <p>a) Both A and R are true and R is the correct explanation of A</p> <p>b) Both A and R are true and R is NOT the correct explanation of A</p> <p>c) A is true but R is false</p> <p>d) A is false and R is also false</p> <p>15. Assertion : A p-type semiconductor is a positive type crystal. Reason : A p-type semiconductor is an uncharged crystal.</p>		1

16.	<p>ASSERTION(A): The electrical conductivity of a semiconductor increases on doping.</p> <p>REASON (R) : Doping always increases the number of electrons in the semiconductor.</p>	
17	<p>Two statements are given-one labeled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a),(b),(c) and (d) as given below.</p> <p>a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is NOT the correct explanation of A c) A is true but R is false d) A is false and R is also false</p> <p>ASSERTION: In an interference pattern observed in Young's double slit experiment, if the separation (d) between coherent sources as well as the distance (D) of the screen from the coherent sources both are reduced to $1/3^{\text{rd}}$, then the new fringe width remains the same.</p> <p>REASON: Fringe width is proportional to (d/D).</p>	1
18	<p>Two statements are given-one labeled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.</p> <p>a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is NOT the correct explanation of A c) A is true but R is false d) A is false and R is also false</p> <p>Assertion(A): The photoelectrons produced by a monochromatic light beam incident on a metal surface have a spread in their kinetic energies.</p> <p>Reason(R): The energy of electrons emitted from inside the metal surface, is lost in collision with the other atoms in the metal.</p>	1

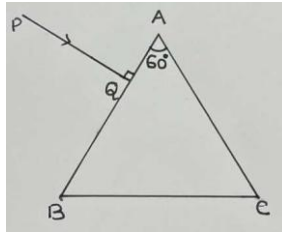
SECTION C		
26.	Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude $17.7 \times 10^{-22} \text{ C/m}^2$. What is electric field intensity E : (a) in the outer region of the first plate, and (b) between the plates?	3
27	State laws of photoelectric effect?	3
28	Explain the processes of nuclear fission and nuclear fusion by using the plot of binding energy per nucleon (BE/A) versus the mass number A .	3
29	An a.c. source generating a voltage $\varepsilon = E_0 \sin \omega t$ is connected to a capacitor of capacitance C . Find the expression for the current I flowing through it. Plot a graph of ε and I versus ωt to show that the current is ahead of the voltage by $\pi/2$. OR An ac voltage $V = V_0 \sin \omega t$ is applied across a pure inductor of inductance L . Find an expression for the current i , flowing in the circuit and show mathematically that the current flowing through it lags behind the applied voltage by a phase angle of $\pi/2$. Also draw graphs of V and I versus ωt for the circuit.	3
30.	Write Bohr's postulates for the hydrogen atom model.	

SECTION D

31	What is p n junction diode. Explain the process involved in information of p n junction diode with the help of suitable diagram OR Explain principle and working of p n junction diode in full wave rectifier?	5
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32	<p>(a) Explain the term drift velocity of electrons in a conductor. Hence obtain the expression for the current through a conductor in terms of drift velocity.</p> <p>(b) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 respectively are connected in parallel as shown in the figure.</p> <p>Deduce the expression for the</p> <ol style="list-style-type: none"> Equivalent emf of the combination equivalent internal resistance of the combination potential difference between the points A and B. <div style="text-align: center;">  <p>The diagram shows a circuit with two parallel branches. The top branch contains a cell with emf E_1 and internal resistance r_1. The bottom branch contains a cell with emf E_2 and internal resistance r_2. The two branches are connected between points A and B. Arrows labeled I indicate current flowing from A to B.</p> </div> <p>OR</p> <ol style="list-style-type: none"> State the two Kirchhoff's rules used in the analysis of electric circuits and explain them. Derive the equation of the balanced state in a Wheatstone bridge using Kirchhoff's laws. 	5
33	<ol style="list-style-type: none"> Prove prism formula Ray PQ is incident normally on the face AB of a 	5

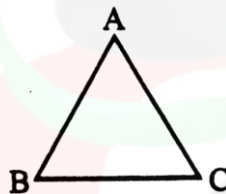
triangular prism of refracting angle 60° as shown in figure. The prism is made of a transparent material of refractive index $2/\sqrt{3}$. Trace the path of the ray as it passes through the prism. Calculate the angle of emergence and the angle of deviation.



OR

(i) A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30° . Calculate the speed of light through the prism.

(ii) Find the angle of incidence at face AB so that the emergent ray grazes along the face AC.



SECTION E

34

Case Study:

Read the following paragraph and answer the questions.

Smallest charge that can exist in nature is the charge of an electron. During friction it is only the transfer of electron which makes the body charged. Hence net charge on any body is an integral multiple of charge of an electron ($1.6 \times 10^{-19} \text{C}$) i.e., $q = \pm ne$ where $n = 1, 2, 3, 4, \dots$

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 as protons or neutrons are elemental units called quarks

- I) If a charge on a body is 1 nC , then how many electrons are present on the body?
- II) Charge is scalar or vector?
- III) A polythene piece rubbed with wool is found to have a negative charge of $3.2 \times 10^{-7} \text{C}$. Calculate the number of electrons transferred.

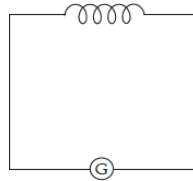
OR

What is charge?

4

Read the following paragraph and answer the questions

When a current I flows through a coil, flux linked with it is $\phi = LI$, where L is a constant known as self inductance of the coil.



Any change in current sets up an induced emf in the coil. Thus, self inductance of a coil is the induced emf set up in it when the current passing through it changes at the unit rate. It is a measure of the opposition to the growth or the decay of current flowing through the coil. Also, value of self inductance depends on the number of turns in the solenoid, its area of cross-section and the permeability of its core material.

I) What is self inductance ?

II) State the factors on which self inductance of a long solenoid depends?

III) What is the induced emf in a coil of 10 henry inductance in which current varies from 9 A to 4 A in 0.2 second

OR

What is Lenz's law ?