CLASS XII
SAMPLE PAPER
PHYSICS

MM-70 **TIME – 3 HRS**

General Instructions:

(1) All questions are compulsory. There are 33 questions in all.

(2)This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

(3) Section A contains ten very short answer questions and four assertion reasoning MCQs of 1 mark each, Section B has two case based questions of 4 marks each, Section C contains nine short answer questions of 2 marks each, Section D contains five short answer questions of 3 marks each and Section E contains three long answer questions of 5 marks each.

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

SECTION – A

All questions are compulsory. In case of internal choices, attempt any one ofthem.

1.Plot the variation of potential difference V with length ℓ for two potentiometrs P and Q where P is more sensitive then Q.

2.In the following nuclear fission reaction

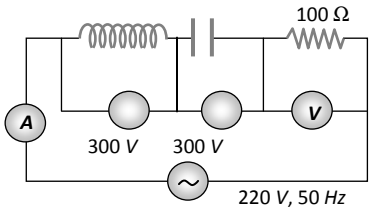
$n + {}^{235}U_{92} \rightarrow {}^{144}Ba_{Z} + {}^{A}X_{36} + 3n + Q$, assign the values of Z and A.

3.The voltage of an ac source varies with time according to the equation

$V = 100sin100\pi t\, cos\, 1\,00\pi t$ is applied across an inductor of inductance 1mH, where tis in seconds and V is in volts. Determine rms current.

OR

In the circuit shown below, what will be the readings of the voltmeter and ammeter



4. Name the part of emwand wavelength of signal having frequency of 300 megahertz?

5. Carbon, silicon and germanium have four valence electrons each. These are characterized by valence and conduction bands separated by energy band gap respectively equal to $(Eg)_C$, $(Eg)_{Si}$ and $(Eg)_{Ge}$.

Arrange these in decreasing order of energy band gap.

OR

What is meant by minority carrier injection?

6. Which part of emwradiated byHuman body ?

7. If both the number of protons and the number of neutrons are conserved in each nuclear reaction, in what way is the mass converted into energy ? Explain.

8.If E_1 ,E_2 ,E_3 ,E_4 are the respective kinetic energies of electron, deuteron, proton and neutron having same De-Broglie wavelength. Rewrite these in increasing orderof their magnitude.

OR

When radiation 5.6eV is incident on a metal surface, Photoelectron are ejected with kinetic energy 4eV, determine stopping potential and work function.

9.Ultraviolet rays, X rays, and gamma rays can bevery harmful to living things. What is uniqueabout these forms of electromagnetic waves thatcould cause damage to living cells?

OR

Does the speed of an electromagnetic wavedepend on either the frequency or wavelength? Justify your answer.

10. Draw the curve showing the variation of potential energy between the nucleon versus distance between the nucleons.

For question numbers 11, 12, 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true but R is NOT the correct explanation of A

c) A is true but R is false

d) A is false and R is also false

11. **Assertion** : When charges are shared between any two bodies, no charge is really lost, but some loss of energy does occur.

Reason :Some energy disappears in the form of heat, sparking *etc*.

12. **Assertion** : The electric bulbs glows immediately when switch is on.

Reason :The drift velocity of electrons in a metallic wire is very high.

13. **Assertion** : A metal piece and a non-metal (stone) piece are dropped from the same height near earth's surface. Both will reach the earth's surface simultaneously.

Reason :There is no effect of earth's magnetic field on freely falling body.

14. Assertion : If a proton and an α-particle enter a uniform magnetic field perpendicularly, with the same speed, then the time period of revolution of the α-particle is double than that of proton.

Reason : In a magnetic field, the time period of revolution of a charged particle is directly proportional to mass.

Section – B

Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

Q15. Auroras

The photograph above is the first image ever obtained of auroras at both the North Pole and the South Pole at the same time — a reminder that Earth's magnetic field protects all living organisms from frequent bombardment by high-energy, charged particles in the solar wind. When the onslaught of charged particles enters Earth's magnetic field at an angle with the field, they curve away from Earth's surface. Many of the particles become trapped in the magnetic field and follow a helical path, circling back and forth in the fieldfor long periods of time. These ions form the ionosphere. Only at the magnetic poles do the charged particles enter Earth's magnetic field parallel to the field lines and, therefore, are not diverted from their path. As these particles collide with oxygen and nitrogen molecules in the atmosphere, they excite the molecules, which then emit light as they return to their ground state.

15.1.Particles having positive charges occasionally come with high velocity from the sky towards the earth. On account of the magnetic field of earth, they would be deflected towards the

(a) North **(b)** South **(c)**East **(d)**West

15.2 If a proton is projected in a direction perpendicular to a uniform magnetic field with velocity v and an electron is projected along the lines of force, what will happen to proton and electron

(a)The electron will travel along a circle with constant speed and the proton will move along a straight line

(b)Proton will move in a circle with constant speed and there will be no effect on the motion of electron

(c)There will not be any effect on the motion of electron and proton

(d)The electron and proton both will follow the path of a parabola

15.3. A proton (or charged particle) moving with velocity v is acted upon by electric field E and magnetic field B. The proton will move undeflected if

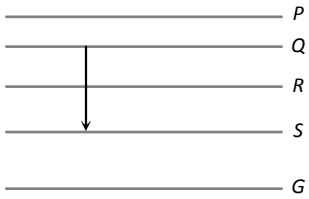
(a) E is perpendicular to B**(b)**E is parallel to v and perpendicular to B

(c) E, B and v are mutually perpendicular and $v = \frac{E}{B}$ **(d)**E and B both are parallel to v

15.4 A charged particle moves in a uniform magnetic field. The velocity of the particle at some instant makes an acute angle with the magnetic field. The path of the particle will be

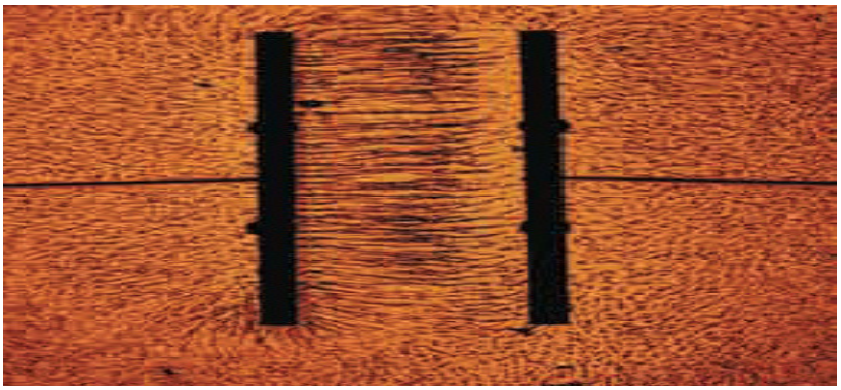
(a)A straight line**(b)** A circle**(c)**A helix with uniform pitch**(d)** A helix with non-uniform pitch

15.5 Figure shows the energy levels P, Q, R, S and G of an atom where G is the ground state. A red line in the emission spectrum of the atom can be obtained by an energy level change from Q to S. A blue line can be obtained by following energy level change

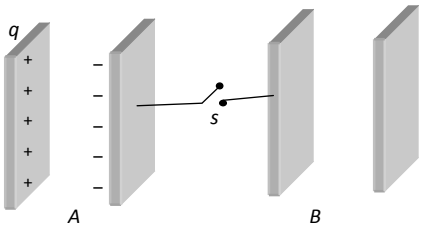


(a) *P* to *Q* **(b)** *Q* to *R* **(c)***R* to *S* **(d)** R to *G*

Q16. Parallel Plates- Charged parallel plates are a convenient way to create an electric field. When two large, oppositely charged parallel plates are placed close together, the electric field between them is uniform, except for a certain spreading or "fringing" of the field at the edges of the plates, as shown in Figure. The plates are too large to act like point charges, but the fact that the total charge on each plate is the sum of a large number of individual charges provides a way to explain the uniform field between the plates .When grass seeds are placed in an electric field between two parallel plates, they line up to reveal the shape of the electric field.The magnitude of the electric field intensity in the region between two points in a uniform electric field is the quotient of the electric potential difference between the points and the component of the displacement between the points .

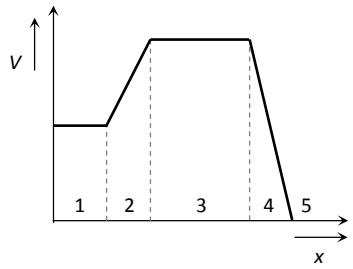


16.1 Consider the situation shown in the figure. The capacitor *A* has a charge *q* on it whereas *B* is uncharged. The charge appearing on the capacitor *B* a long time after the switch is closed is



(a) Zero (b) $q/2$ (c) q (d) $2q$

16.2 The figure gives the electric potential *V* as a function of distance through five regions on x-axis. Which of the following is true for the electric field *E* in these regions



(a) $E_1 > E_2 > E_3 > E_4 > E_5$ (b) $E_1 = E_3 = E_5$ and $E_2 < E_4$

(c) $E_2 = E_4 = E_5$ and $E_1 < E_3$ (d) $E_1 < E_2 < E_3 < E_4 < E_5$

16.3 While a capacitor remains connected to a battery and dielectric slab is applied between the plates, then

(a) Potential difference between the plates is changed(b)Charge flows from the battery to the capacitor

(c) Electric field between the plates increases(d)Energy store in the capacitor decreases

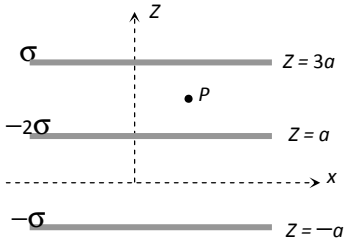
16.4. Three infinitely long charge sheets are placed as shown in figure. The electric field at point *P* is

(a) $\frac{2\sigma}{\varepsilon_o}\hat{k}$

(b) $-\frac{2\sigma}{\varepsilon_o}\hat{k}$

(c) $\frac{4\sigma}{\varepsilon_o}\hat{k}$

(d) $-\frac{4\sigma}{\varepsilon_o}\hat{k}$



16.5 Two plates are at potentials –10 *V* and +30 *V*. If the separation between the plates be 2 *cm*. The electric field between them is

(a) 2000 *V/m* (b) 1000 *V/m* (c) 500 *V/m* (d) 3000 *V/m*

Section – C

All questions are compulsory. In case of internal choices, attempt anyone.

17. Explain the formation of depletion region and barrier potential set up in a p-n junction?

OR

Draw circuit diagram, input and output waveform of full wave Rectifier.

18.Get an expression for nuclear density and show that nuclear density does not depend on the mass and size of the nucleus.

19. In a type of charge configuration electric field at a point due to it is

i) independent of distance from the point

ii) inversely proportional to the distance from the point

iii) inversely proportional to the square of distance from the point

iv) inversely proportional to the cube of distance from the point

Identify the type of charge configuration in each case.

OR

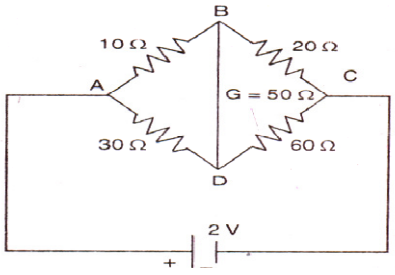
Draw or describe schematically equipotential surface for the following cases

i) uniform electric field along z- direction

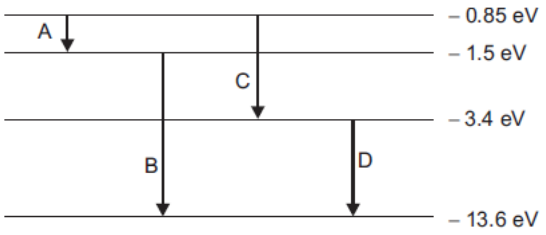
ii) an electric field that uniformly increases in magnitude but remains same in x-direction

20.Distinguish between 'P type' and 'N type' semi-conductors using **energy band diagram**.

21.What is **the current** flowing in the arm AB& AD of this circuit

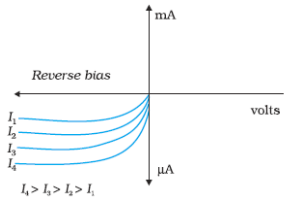


22. The energy levels of an element are given below:

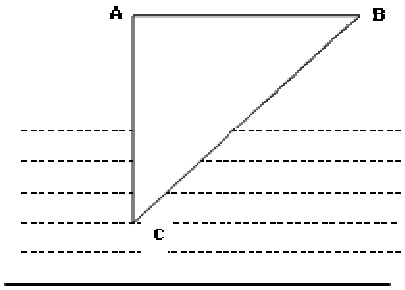


Identify, using necessary calculations, the transition, which corresponds to the emission of a spectral line of wavelength 496nm.

23. From I-V characteristics identify **type of diode**, how to **fabricate** such diodes, draw the required **circuit diagram**.



24.A ray of light incident normally on the face AB of the right angled glass prism of refractive index $\sqrt{2}$. The prism is partly immersed in a liquid of refractive index $\sqrt{3}/\sqrt{2}$. Find the value of angle B so that the ray grazes along the face BC.



OR

Drawraydiagramwhenincidentrayfallsnormallyononeofthetwoequalsidesofarightangledisoscelesprismhavingrefractivei ndex$\mu = \sqrt{3}$.

25. Name a device which is used for long distance communication without **much loss of power**. Write the principle behind it. Briefly explain about its construction.

Section -D

All questions are compulsory. In case of internal choices, attempt any one.

26. Using experiment on photoelectric effect plot variation of photoelectric current with plate potential to show

(i) Photo electric current depends upon intensity of incident radiation and independent of frequency.

(ii) Stopping potential depends upon frequency of incident radiation and independent of intensity. And

(iii) Also Plot the graph to show variation of V_{max}^2 of photo electrons with frequency of incident radiation

27. In a single slit experiment, how does the angular width of the central maxima vary, when

(i) aperture of slit is increased
(ii) distance between the slit and screen is decreased
(iii) monochromatic source of light replaced by white light?**Justify your answer in each case.**

28. Using Biot Savart Law, derive an expression for the magnetic field at the center of a circular coil of radius R, carrying current I.

OR

(i)Define eddy currents. What is its disadvantage?

(ii)The magnetic flux linked with a coil varies with time as $\phi = 2t^3 + 3t^2 + 9$ weber. What is the induced emf att=1s?

29. When an inductor L and a resistor R in series are connected across 60V,50Hz supply, a current of 0.4A flows in the circuit, the current differs in phase from applied voltage by π/6 radian. Calculate voltage across L and R.

30. Twoharmonicwavesofmonochromaticlight $Y_1 = a\cos\omega t$ and $Y_2 = a\cos(\omega t+\phi)$

are superimposedon eachother.Writetheconditionsforconstructiveanddestructiveinterferenceintermsofthephaseangleϕ. Hence showthatmaximum intensityin interferencepatternisfourtimestheintensityduetoeachwave.

OR

ProveSnell'slawusingHuygen'swavetheorywhenlightistravellingfromadensertoararermedium.
Drawthesketchestodifferentiatebetweenplanewavefrontandsphericalwavefront.

Section – E

All questions are compulsory. In case of internal choices, attempt any one.

31. (i) What are the two ways of adjusting the position of the eyepiece while observing the final image in a compound microscope? Which of these is usually preferred and why?
(ii) Obtain an expression for the magnifying power of a compound microscope for that preferred position of image using proper ray diagram.
(iii) Calculate the maximum magnification obtained by a compound microscope having an objective of power64D and an eyepiece of power40D and a tube length of 25 cm.

OR

(i) Write two essential conditions for sustained interference pattern to be produced on the screen.

(ii) Draw a graph showing the variation of intensity versus the position on the screen in Young's experiment when **(a)** both the slits are opened and **(b)** one of the slit is closed.

(iii) What is the effect on the interference pattern in Young's double slit experiment when: **(a)** Screen is moved closer to the plane of slits? **(b)**Separation between two slits is increased. **Explain your answer in each case.**

32.(i). Write the function of a transformer. State its principle of working with the help ofa diagram. Mention various energy losses in this device.
(ii). The primary coil of an ideal step-up transformer has 80 turns and transformationratio is also 80. The input voltage and power are respectively 80 V and 960 W.Calculate
a. number of turns in secondary, **b**. current in primary, **c**. voltage across secondary, **d**. current in secondary

OR

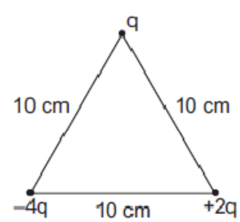
Explain the principle and working of a moving coil galvanometer with the help of a labeled diagram.

Give reason why

(i)moving coil galvanometer as such cannot be used to measure current in the circuit?

(ii) radial field required in moving coil galvanometer?

33.(a) Calculate the work done to dissociate the system of three charges placed on the vertices of a triangle as shown. Here q =3X10^{-18} C.



(b) A parallel plate capacitor of capacity C_0 is charged to a potential V_0
(i) The energy stored in the capacitor when the charging battery is kept connected and the separation between the capacitor plates is doubled isE_1
(ii) The energy stored in the capacitor when the battery is disconnected and the separation is doubled isE_2. Then calculateE_1/E_2.

OR

Define the term drift velocity, mobility and current density, relate these with each other (one formula).
How these are changed with**(i)** rise in temp and
(ii)potential difference applied across the conductor.

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