MAITRI VIDYA NIKETAN, EMSSS, RISALI, BHILAI

PRE-BOARD EXAMINATION 2022-23

CLASS: XII SUBJECT: PHYSICS

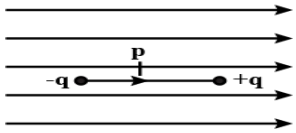
TIME: 3HRS **MAX. MARKS: 70**

General Instructions:

1. All questions are compulsory. There are 35 questions in all.
2. The question paper has 5 sections Section A, Section B, Section C, Section D & Section E
3. Section A contains eighteen questions of 1mark each. Section B has seven questions 2 marks each, Section C has five questions 3 marks each, Section D has three questions of 5 marks each and Section E contains 2 case study based questions of 4 marks each.
4. There is no overall choice. However an internal choice has been provided Section B,C,D & E

SECTION A

1. Figure shows electric field lines in which an electric dipole P is placed as shown. Which of the following statements is correct?



(a)The dipole will not experience any force.
(b). The dipole will experience a force towards right.
(c). The dipole will experience a force towards left
(d.) The dipole will experience a force upwards.

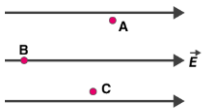
2. Two equal and opposite charges (+q and -q) are situated at a distance x from each other. The value of potential at very far point will depend upon
(a). Only on q
(b). Only on x
(c). On q.x
(d.) On q /x

3.The temperature coefficient of resistance of an alloy used for making resistors is
(a). Small and positive
(b). Small and negative
(c.) Large and positive
(d.) Large and negative

4 . On bombarding U^{235} by a slow neutron 200 MeV energy is released. If the power output of atomic reactor is 1.6 MW, then the rate of fission is

(a)$5 \times 10^{22}\ S^{-1}$
(b) $5 \times 10^{16}\ S^{-1}$
(c) $8 \times 10^{16}\ S^{-1}$
(d) $20 \times 10^{16} S^{-1}$

5. What is the electric potential of the points A, B, and C which are in a uniform electric field?



(a)The electric field is the same at all three points A, B, and C
(b) Maximum at A
(c) Maximum at B
(d) Maximum at C

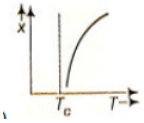
6. If the orbital radius of the electron in hydrogen atom is 4.7 $x10^{-11}$ m, compute kinetic energy of the electron in hydrogen atom
(a)15.3 eV
(b) -1.53 eV
(c) 1.36 eV
(d) -13.6 eV

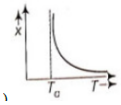
7. Which of the following statements is incorrect?

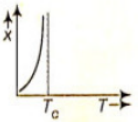
(a) the velocity of light in medium is $v = \frac{1}{\sqrt{\mu\,\varepsilon}}$ thus depends on both the electric & magnetic properties
(b)They cannot be deflected by any field
(c) The constant velocity of EMW in vacuum is used to define time
(d) the direction of propagation is direction of wave

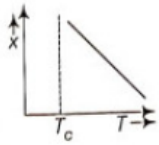
8. Two circular coils 1 and 2 are made from the same wire but the radius of the first coil is twice that of the second coil. What ratio of the potential difference (in volt) should be applied across them, so that the magnetic field at their centres is the same?
(a) 2
(b) 3
(c) 4
(d) 6

9. Ferromagnetic material can be plotted as

(a) 

(b) 

(c) 

(d) 

10.A coil having n turns and resistance R Ω is connected with a galvanometer of resistance 4R Ω. This combination is moved in time t seconds from a magnetic flux ϕ1 weber to, ϕ2 weber. The induced current in the circuit is
(a) (ϕ1-ϕ2)/5 R n t
(b) -n(ϕ1-ϕ2)/5Rt

(c) -(ϕ1-ϕ2)/Rnt
(d) -n(ϕ1-ϕ2)/Rt

11. In an LCR circuit, capacitance is changed from C to 2C. For the resonant frequency to remain unchanged, the inductance should be changed from L to
(a)4L
b)2L
(c)L/2
(d)L/4

12. The self inductance of a coil is a measure of
(a) electrical inertia
(b) electrical friction
(c) induced e.m.f.
(d) induced current

13. An iron core transformer with a turns ratio of 8 : 1 has 120 V applied across the primary. The voltage across the
(a) 15 V
(b) 120 V
(c) 180 V
(d) 960 V

14. The phase difference between the two light waves reaching a point P is 100π. The path difference is
(a) 10λ
(b) 25 λ
(c) 50 λ
(d) 100 λ

15. The threshold frequency for photoelectric effect on sodium corresponds to a wavelength of 5000 Å. Its work function is
(a) 4×10^{-19} J
(b)1 J
(c) 2×10^{-19} J
(d) 3×10^{-19} J

16. 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 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
Assertion: It is not possible to have interference between the waves produced by two violins.
Reason: For interference of two waves the phase difference between the waves must remain constant.

17 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 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
Assertion: The resistivity of a semiconductor increases with temperature.
Reason: The atoms of a semiconductor vibrate with larger amplitudes at higher temperatures thereby increasing its resistivity.

18 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 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

Assertion: In photoelectron emission, the velocity of electron ejected from near the surface is larger than that coming from interior of metal.

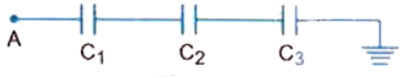
Reason: The velocity of ejected electron will be zero

SECTION B

19.Show that the radius of the orbit in hydrogen atom varies as n^2, where n is the principal quantum number of the atom.

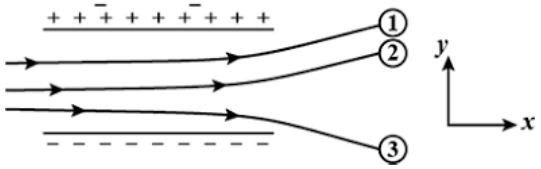
20.Distinguish between 'intrinsic' and 'extrinsic' semiconductors.

21.Calculate the potential difference in the capacitance C2 in the circuit shown. The potential at A is 90V and C1 = 20 μF , C2 = 30 μF, C3=15 μF



Or

Figure shows tracks of three charged particles in a uniform electrostatic field. Give the signs of the three charges. Which particle has the highest charge to mass ratio?



22. Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope

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

24. Laser light of wavelength 640 nm incident on a pair of slits produces an interference pattern in which the bright fringes are separated by 7.2 mm. Calculate the wavelength of another source of light which produces interference fringes separated by 8.1 mm using same arrangement. Also find the minimum value of the order 'n' of bright fringe of shorter wavelength which coincides with that of the longer wavelength

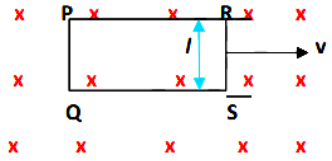
25. Identify the different types of electromagnetic radiations, which are used to i) kill germs, ii) used for physical therapy.

SECTION C

26. Derive the expression for force per unit length between two long straight parallel current carrying conductors. Hence define one ampere

27. Define the terms (i) 'cut-off voltage' (ii) 'threshold frequency' in relation to the phenomenon of photoelectric effect. Using Einstein's photoelectric equation show how the cut off voltage and threshold frequency for a given photosensitive material can be determined with the help of a suitable plot/graph.

28. Figure shows a rectangular conducting loop PQSR in which arm RS of length 'l' is movable. The loop is kept in a uniform magnetic field B directed downwards perpendicular to the plane of the loop. The arm RS is moved with a uniform speed v. Deduce an expression for : (i) The emf induced across the arm RS. (ii) The external force required to move the arm, and (iii) The power dissipated as heat



Or

State Lenz's law. Give one example to illustrate this law. The Lenz's law is a consequence of the principle of conservation of energy. Justify this statement.

29. State the underlying principle of a transformer. Can a transformer be used to step up or step down a d.c. voltage? In brief explain its working.

30. The ground state energy of hydrogen atom is -13.6 eV.

(i) What is the kinetic energy of an electron in the 2^{nd} excited state?

(ii) If the electron jumps to the ground state from the 2^{nd} excited state, calculate the wavelength of the spectral line emitted?

SECTION D

31. i) In Young's double slit experiment, deduce the condition for (a) constructive,' and (b) destructive interference at a point on the screen. Draw a graph showing variation of intensity in the interference pattern against position 'x' on the screen

(ii) Compare the interference pattern observed in Young's double slit experiment with single slit diffraction pattern, pointing out three distinguishing features

OR

a) Draw a ray diagram for the final image formed at a distance of distinct vision (D) by a compound microscope and write expression for its magnifying power

b) An angular magnification (magnifying power) of 30 X is desired using an objective of focal length 1.25 cm and an eyepiece of focal length 5 cm. How will you set up the compound microscope?

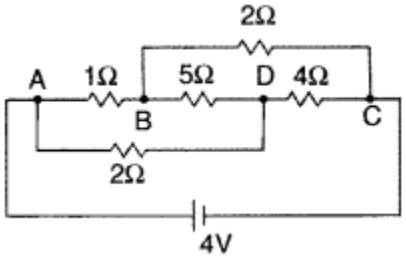
32. a) Define the term drift velocity On the basis of electron drift derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. On what factors does resistivity of a conductor depends on.

b) Define the term 'Mobility' of charge carriers in a conductor. Write its S.I. unit.

OR

a) Use Kirchhoff's rules to obtain conditions for the balance condition in a Wheatstone bridge.

b) Calculate the current drawn from the battery by the network of resistors shown in the figure.



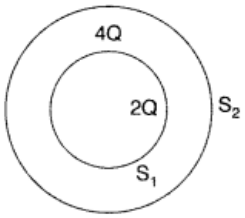
33. a) Obtain the expression for the potential due to a point charge.

(b) Use the above expression to show that the potential, due to an electric dipole (length 2a), varies as the 'inverse square of the distance r of the 'field point' from the centre of the dipole for r > a.

OR

a) (a) Deduce the expression for the torque acting on a dipole of dipole moment $p\rightarrow$ in the presence of a uniform electric field E.

b) Consider two hollow concentric sph eres, S_1 and S_2, enclosing charges 2Q and 4Q respectively as shown in the figure.



(i) Find out the ratio of the electric flux through them.

(ii) How will the electric flux through the sphere S_1 change if a medium of dielectric constant 'ε_r' is introduced in the space inside S_1, in place of air? Deduce the necessary expression

SECTION E

Read the following paragraphs and answer the following questions.

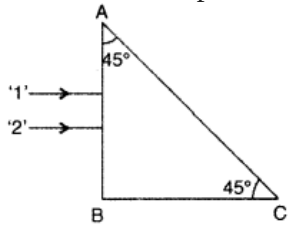
34. A prism is a portion of a transparent medium bounded by two plane faces inclined to each other at a suitable angle. A ray of light suffers two refractions on passing through a prism and hence deviates through a certain angle from its original path. The angle of deviation of a prism is, $\delta = (\mu - 1) A$, through which a ray deviates on passing through a thin prism of small refracting angle A. If μ is refractive index of the material of the prism, then prism formula is,$\mu = \sin (A+\delta m/ 2)/ \sin A/2$

i) How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced with red light?

ii) How does the angle of minimum deviation of a glass prism of refractive index 1.5 change, if it is immersed in a liquid of refractive index 1.3?

iii) Plot a graph showing the variation of the angle of deviation with the angle of incidence.

iv) Two monochromatic rays of light are incident normally on the face AB of an isosceles right angled prism ABC. The refractive indices of the glass prism for the two rays '1' and '2' are respectively 1.35 and 1.45. Trace the path of these rays entering through the prism



35. A p-n junction is a single crystal of Ge or Si doped in such a manner that one half portion of it acts as p-type semiconductor and other half functions as n-type semiconductor. As soon as junction is formed, the holes from the p-region diffuse into the n-region and electrons from -region diffuse into p-region. This results in the development of potential barrier VB across the junction which opposes the further diffusion of electrons and holes through the junction. The small region in the vicinity of the junction which is depleted of free charge carriers and has only immobile ions is called the depletion region.

i)) Why is germanium preferred over silicon for making semiconductor devices?

ii)) Which type of biasing results in a very high resistance of a p n junction diode. Draw a diagram showing this bias.

iii))How does the width of the depletion region of a pn junction vary, if the reverse bias applied to it decreases.

iv)Name the 2 important processes involved in the formation of a p n junction.