KENDRIYA VIDYALAYA SANGATHAN, JAMMU REGION

PRE BOARD – I SESSION 2025-26 **SET 2**

CLASS: XII

SUBJECT: PHYSICS

TIME: 3 HRS **M.M: 70**

General Instruction:

1. All questions are compulsory.
2. There are **33** questions in total. Questions **1** to **16 (SECTION A)** are MCQs and Assertion Reason type questions and carry **one** mark each.
3. Questions **17** to **21 (SECTION B)** carry **two** marks each, questions **22** to **28 (SECTION C)** carry **three** marks each, and questions **29** to **30 (SECTION D)** are case based Questions with 4 questions of 1 mark each and question 31 to 33 **(SECTION E)** carry **five** marks each.
4. There is no overall choice. However, an internal choice has been provided in one question of three marks, and all three question of five marks each weightage. You have to attempt only one of the choices in such questions.
5. Use of calculators is **not** permitted. However, you may use log tables if necessary.
6. You may use the following values of physical constants wherever necessary.

   $c = 3 \times 10^8 ms^{-1}$

   $h = 6.6 \times 10^{-34} Js$

   $e = 1.6 \times 10^{-19}$ C

   $\mu_o = 4\pi \times 10^{-7}$ T m A $^{-1}$

   $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 Nm^2C^{-1}$

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

   Avogadro's number $N_A = 6.023 \times 10^{23}$/mole

   Mass of neutron $m_n = 1.6 \times 10^{-27}$ kg

   Mass of electron $m_e = 9 \times 10^{-31}$ kg

SECTION A(1 MARK EACH)

1.An electric dipole placed in an electric field of intensity 2×10^5 N/C at an angle of 30° experiences a torque equal to 4 Nm. The charge on the dipole of dipole length 2 cm is

A.7 μC B. 8 mC C. 2 mC D. 5 mC

2. Which of the following is not the property of an equipotential surface?

A. They do not cross each other.

B. The work done in carrying a charge from one point to another on an equipotential surface is zero.

C. For a uniform electric field, they are concentric spheres.

D. They can be imaginary spheres.

3. A parallel plate capacitor of capacity 50 μF is charged to 10 V. Its energy is equal to

(A) 2.5×10^{-3} J B. 2.5×10^{-4} J 4 C. 5×10^{-2} J D. 1.25×10^{-8} J

4. The EMF induced in a 10H inductor in which current changes from 11A to 2A in $9X10^{-1}$ sec is

A.104V B. 103V C.102V D.10V

5. A galvanometer of resistance G is converted into an ammeter of range 0 to I A. If the current through the galvanometer is 0.1% of I A, the resistance of the ammeter is :

(A) G/999 ohm (B) G/1000 ohm (C) G/1001ohm (D) G/100·1ohm

6. A bar magnet having a magnetic moment of 2 x 10 J T^{-1} is free to rotate in a horizontal plane. A horizontal magnetic field B = 6 x 10^{-4} T exists in the space. The work done in taking the magnet slowly from a direction parallel to the field to a direction 60° from the field is
(a) 5 J (b) 6 J (c) 7 J (d) 8 J

7. The number of turns in the primary and secondary coils of a transformer are 100 and 300 respectively. If the input power is 60 watt, the power output is
(a) 100W (b) 300W (c) 180W (d) 60W

8. Waves in decreasing order of their wavelength are
a) X-rays, infrared rays, visible rays, radio waves
b) radio waves, visible rays, infrared rays, X-rays.
c) radio waves, infrared rays, visible rays, X-rays.
d) radio waves, ultraviolet rays, visible rays, X-rays

9. An air Bubble under water shines brightly because of the phenomenon of
(A) Interference (B) Total internal reflection (C) Dispersion (D) Diffraction

10. A convex lens is dipped in a liquid, whose refractive index is equal to the refractive index of the lens. Then, its focal length will
(A) Become zero (B) Become infinite (C) Remain unchanged (D) Become small, but non-zero

11. A short pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab, the first colour to emerge is
(A) blue (B) green (C) violet (D) red

12. For a given kinetic energy, which of the following has smallest de Broglie wavelength:
(a) electron (b) proton (c) deuteron (d)α –particle

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.
(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) If the Assertion is correct but Reason is incorrect.
(d) If the Assertion is wrong and Reason is correct.

13. Assertion: Potential difference across the terminals of a cell is always less than its emf.
Reason: Emf of a cell is the maximum potential difference across the terminals of a cell in an open circuit.

14. 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.

15. Assertion : The velocity of electromagnetic waves depends on electric and magnetic properties of the medium. Reason : Velocity of electromagnetic waves in free space is constant.

16. Assertion: In the process of photoelectric emission, all emitted electrons have the same kinetic energy.
Reason: According to Einstein's equation Ek = hv -ϕ_0

Section-B (2 MARKS EACH)

17. Derive the expression for the electric field intensity due to an infinitely long straight charged wire.

18.Draw V-I graph for ohmic and non- ohmic materials. Give one example for each

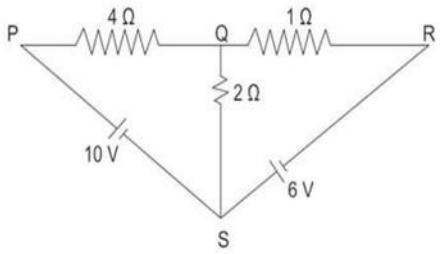
19.An alternating voltage e = 200√2 sin (100t) volt is connected to 1μF capacitor through a.c. ammeter. What will be the reading of ammeter?

20.Monochromatic light of wavelength 600 nm is incident from air on a glass surface. What are the wavelength, frequency and speed of refracted light? Refractive index of glass is 1.5.

21. When light of wavelength 400 nm is incident on the cathode of a photocell, the stopping potential recorded is 6 V. If the wavelength of the incident light is increased to 600 nm, calculate the new stopping potential.

Section-C(3 MARKS EACH)

22. Using Kirchhoff's laws, calculate the current flowing through 4 Ω, 1 Ω, and 2 Ω resistors in the circuit shown .



23. Using Biot Savart law derive the expression of magnetic field at a point along the axis of a circular current carrying loop.

Or

An ammeter of resistance 0.80 Ω can measure current upto 1.0 A.
(i) What must be the value of shunt resistance to enable the ammeter to measure current upto 5.0A?
(ii) What is the combined resistance of the ammeter and the shunt?

24. Define mutual inductance between two long coaxial solenoids. Find out the expression for the mutual inductance of inner solenoid of length 'L' having the radius r_1 and the number of turns n_1 per unit length due to the second outer solenoid of same length and n_2 number of turns per unit length.

25. Identify the part of the electromagnetic spectrum which:
a) produces heating effect,
b) is absorbed by the ozone layer in the atmosphere,
c) is used for studying crystal structure. Write any one method of the production of each of the above radiations.

26. Draw diagram of astronomical telescope in normal adjustment position. Write down the expression for its magnification.

27. Draw a plot showing the variation of binding energy per nucleon versus the mass number (A). Explain with the help of this plot the release of energy in the processes of nuclear fission and fusion.

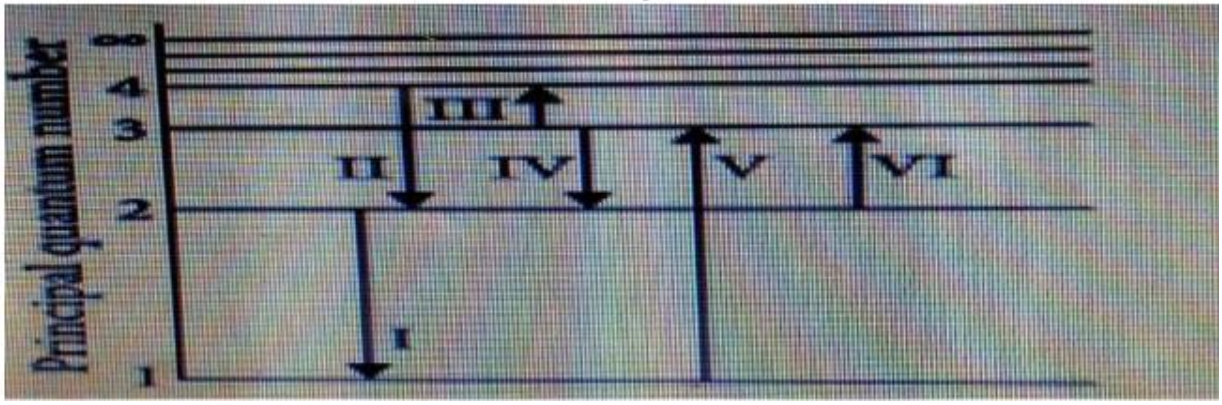
28. (a) Name the device which utilizes unilateral action of a pn diode to convert ac into dc.
(b) Draw the circuit diagram of full wave rectifier.

Section-D (Case Based)

29. Read the given passage and answer the questions given below

Electron Transitions for the Hydrogen Atom Bohr's model explains the spectral lines of hydrogen atomic emission spectrum. While the electron of the atom remains in the ground state, its energy is unchanged. When the atom absorbs one or more quanta of energy, the electrons move from the ground state orbit to the

excited state orbit that is further away. The given figure shows an energy level diagram of the hydrogen atom. Several transitions are marked as I,II,III and so on. The diagram is only indicative and to scale.



(i) In which transition is Balmer series photon absorbed?
(a) II (b) III (c) IV (d) VI

(ii) The wavelength of the radiation involved in transition II is
(a) 291 nm (b) 364 nm (c) 487 nm (d) 652 nm

(iii) Which transition will occurwhen a hydrogen atom is irradiated with radiation of wavelength 103 nm?
(a) I (b) II (c) IV (d) V

(iv) The electron in a hydrogen atom makes a transition from n = n1 to n = n2 state. The time period of the electron in the initial state is eight times that in the final state. The possible values of n1 and n2 are
(a) n1 = 4 and n2 = 2 (b) n1 = 8 and n2 = 2 (c) n1 = 8 and n2 = 3 (d) n1 = 6 and n2 = 2

30. Read the given passage and answer the questions given below

A rectifier is an essential component used in converting AC (Alternating Current) to DC (Direct Current). A half-wave rectifier allows current to pass through during only one half of the input AC cycle, whereas a full-wave rectifier allows current to pass during both halves of the cycle, making it more efficient. Consider a full-wave bridge rectifier circuit connected to a 240V AC input, a load resistor of 100Ω, and a diode forward voltage drop of 0.7V for each diode in the rectifier.

Q1: What is the primary function of a rectifier?
A. To amplify AC signals B. To convert AC to DC
C. To convert DC to AC D. To stabilize voltage levels

Q2: How does a full-wave bridge rectifier differ from a half-wave rectifier?
A. A half-wave rectifier allows current during both halves of the AC cycle, while a full-wave rectifier blocks both halves
B. A full-wave rectifier allows current during both halves of the AC cycle, while a half-wave rectifier allows current only during one half
C. A half-wave rectifier produces smoother DC output than a full-wave rectifier
D. A full-wave rectifier blocks both positive and negative cycles of the input AC signal

Q3: If the AC input voltage is 240V RMS, what is the peak DC output voltage of the full-wave bridge rectifier, assuming a forward voltage drop of 0.7V for each diode?
A. 240V B. 339.4V C. 337.2V D. 236.6V

Q4: If one of the diodes in the full-wave bridge rectifier fails and becomes an open circuit, what will be the effect on the output voltage?
A. The output voltage will become zero
B. The rectifier will continue to work as a full-wave rectifier

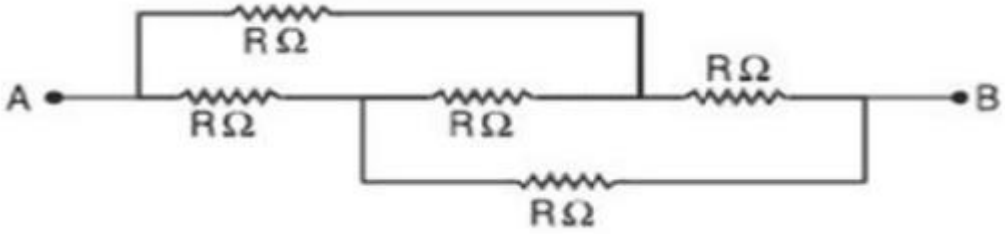
C. The rectifier will behave like a half-wave rectifier, and the output voltage will decrease.
D. The rectifier will produce double the original output voltage

Section-E (5 MARKS EACH)

31.(a) Derive expression for capacitance of a parallel plate capacitor having dielectric slab of thickness 't' and dielectric constant K between the plates. t< separation between plates.
(b) When two charged capacitors having different capacities and different potentials are joined together, show that there is always some loss of energy.

Or

(a)Calculate the equivalent resistance between points A and B in the figure given below



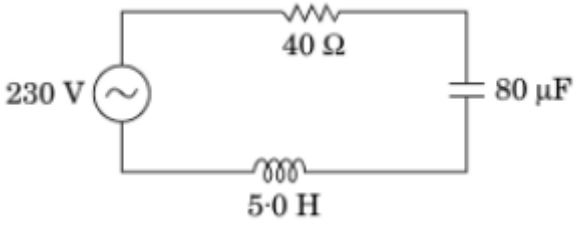
(b) A wire of resistance 8R is bent in the form of a circle. What is the effective resistance between the ends of the diameter?

32.

(a) With help of a diagram explain, principal, construction and working of an AC generator.
(b) A capacitor in series with a resistance of 30Ω is connected to A.C. mains. The reactance of the capacitor is 40Ω. Calculate the phase difference between the current and the supply voltage.

Or

(a) A transformer of 100% efficiency has 200 turns in the primary and 40000 turns in the secondary. It is connected to a 220-V main supply and the secondary feeds to a 100 kΩ resistance. Calculate the output potential difference per turn and the power delivered to the load.
(b) The figure shows a series LCR circuit connected to a variable frequency 230 V source.
(i) Determine the source frequency which drives the circuit in resonance.
(ii) Calculate the impedance of the circuit and amplitude of current at resonance.



33.(a)With help of labelled diagram derive relation between refracting index, radius of aperture, image and object distance for refraction at a spherical convex surface from rarer to denser medium.
(b) Using above result derive lens maker formula.

Or

(a) Define wavefront. Use Huygens' principle to verify the laws of refraction.
(b) In a double slit experiment using light of wavelength 600 nm, the angular width of the fringe formed on a distant screen is 0.1°. Find the spacing between the two slits.