

# COMMON HALF YEARLY EXAMINATION - 2023

Standard XII

Reg No.

## PHYSICS

Time : 3.00 hrs

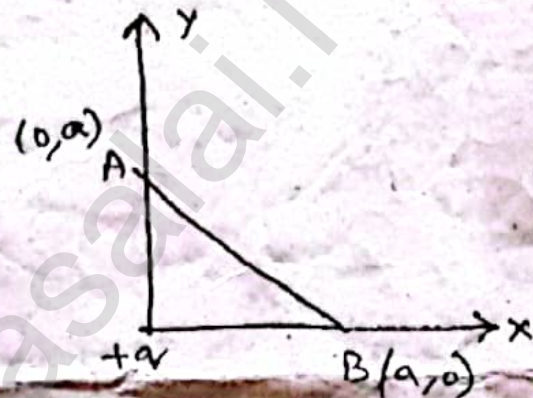
Part - I

Marks : 70

1. Choose the correct answer:

15 x 1 = 15

- In bohr atom model, when the Principal Quantum Number ( $n$ ) increases the velocity of electron
  - increases and then decreases
  - increases
  - decreases
  - remains constant
- In the given diagram, a point charge  $+q$  is placed at the origin O. Workdone in taking another point charge  $-Q$  from point A to point B is \_\_\_\_\_.



- $\frac{qQ}{4\pi\epsilon_0 a^2} \left(\frac{a}{\sqrt{2}}\right)$
- zero
- $\left[\frac{-qQ}{4\pi\epsilon_0 a^2}\right] \sqrt{2} a$
- $\left[\frac{qQ}{4\pi\epsilon_0 a^2}\right] \sqrt{2} a$

- The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number  $A$  varies as \_\_\_\_\_.

- $A^{5/3}$
- $A^{2/3}$
- $A^{4/3}$
- $A^{1/3}$

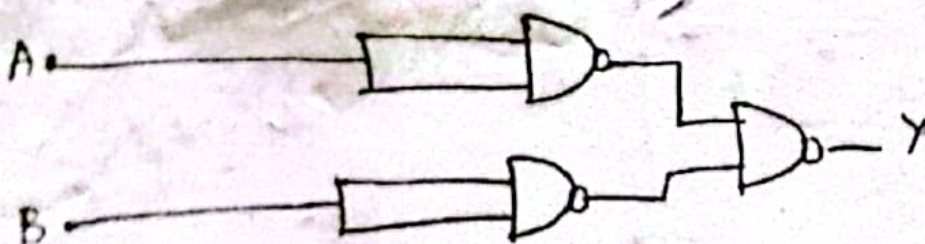
- Two light waves from slit  $S_1$  and  $S_2$  on reaching points P and Q on a screen in Young's double slit experiment have a path difference zero and  $\lambda/4$  respectively. The ratio of light intensities at P and Q will be \_\_\_\_\_.

- 4 : 1
- 3 : 2
- $\sqrt{2} : 1$
- 2 : 1

- The radius of curvature of curved surface of a thin plano convex lens is 10 cm and the refractive index is 1.5. If plane surface is silvered then the focal length will be \_\_\_\_\_.

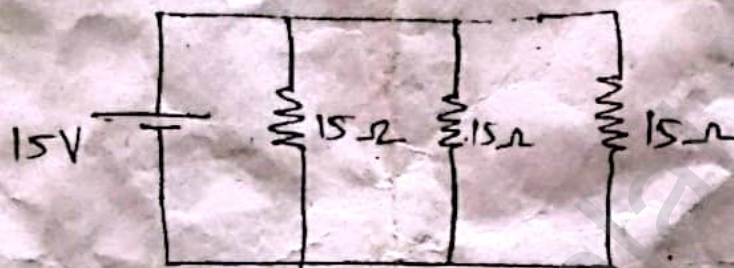
- 20 cm
- 5 cm
- 10 cm
- 15 cm

- The given electrical network is equivalent to \_\_\_\_\_.



- NAND gate
- OR gate
- NOT gate
- EX-OR gate

7. Magnetic field at any point at a distance  $R$  due to a long straight conductor carrying current varies as \_\_\_\_\_.
- a)  $R^2$                       b)  $R$                       c)  $\frac{1}{R^2}$                       d)  $\frac{1}{R}$
8. If voltage applied on a capacitor is increased from  $V$  to  $2V$ , choose the correct conclusion
- a) Both  $Q$  and  $C$  remain the same                      b)  $Q$  remains the same,  $C$  is doubled
- c)  $Q$  is doubled,  $C$  is doubled                      d)  $C$  remains the same,  $Q$  is doubled
9. A light of wavelength  $500 \text{ nm}$  is incident on a sensitive plate of photoelectric work function  $1.235 \text{ eV}$ . The kinetic energy of the photoelectrons emitted is \_\_\_\_\_.
- a)  $1.16 \text{ eV}$                       b)  $0.58 \text{ eV}$                       c)  $2.48 \text{ eV}$                       d)  $1.24 \text{ eV}$
10. The current in the circuit is \_\_\_\_\_.



- a)  $4 \text{ A}$                       b)  $1 \text{ A}$                       c)  $2 \text{ A}$                       d)  $3 \text{ A}$
11. The frequency range of  $30 \text{ MHz}$  to  $400 \text{ GHz}$  is used for
- a) satellite communication                      b) ground wave propagation
- c) space wave propagation                      d) sky wave propagation
12. In an oscillating LC circuit, the maximum charge on the capacitor is  $Q$ . The charge on the capacitor when the energy is stored equally between the electric and the magnetic field is \_\_\_\_\_.
- a)  $Q$                       b)  $\frac{Q}{2}$                       c)  $\frac{Q}{\sqrt{3}}$                       d)  $\frac{Q}{\sqrt{2}}$
13. Type of material which emits white light in LED
- a)  $\text{GaInN}$                       b)  $\text{SiC}$                       c)  $\text{AlGaP}$                       d)  $\text{GaAsP}$
14. A particle of mass  $m$ , carrying charge  $q$  is accelerated through a potential of  $V$  Volt. When this accelerated charge comes under the influence of perpendicular magnetic field, the force acting on it is \_\_\_\_\_.
- a)  $\sqrt{\frac{2q^3BV}{m^3}}$                       b)  $\sqrt{\frac{2q^3BV}{m}}$                       c)  $\sqrt{\frac{q^3B^2V}{2m}}$                       d)  $\sqrt{\frac{2q^3B^2V}{m}}$
15. Charging current for a capacitor is  $0.2 \text{ A}$ , find the displacement current
- a) zero                      b)  $0.2 \text{ A}$                       c)  $0.4 \text{ A}$                       d)  $0.1 \text{ A}$

## Part - II

6 × 2 = 12

II. Answer any 6 questions. (Q.No.24 is compulsory)

16. What is Corona discharge?
17. What is skip area?
18. An ideal transformer has 460 and 40,000 turns in the primary and secondary coils respectively. Find the voltage developed per turn of the secondary coil if the transformer is connected to a 230 V AC main.
19. Distinguish between Fresnel and Fraunhofer types of diffraction.
20. What do you mean by doping?
21. What are the uses of X-rays?
22. What are the properties of neutrino?
23. Why electron is preferred over X-Ray in microscope?
24. Two materials X and Y are magnetised whose intensity of magnetisation for  $500 \text{ Am}^{-1}$  and  $2000 \text{ Am}^{-1}$  respectively. The magnetising field is  $1000 \text{ Am}^{-1}$ . What is the ratio between the susceptibilities of the two material?

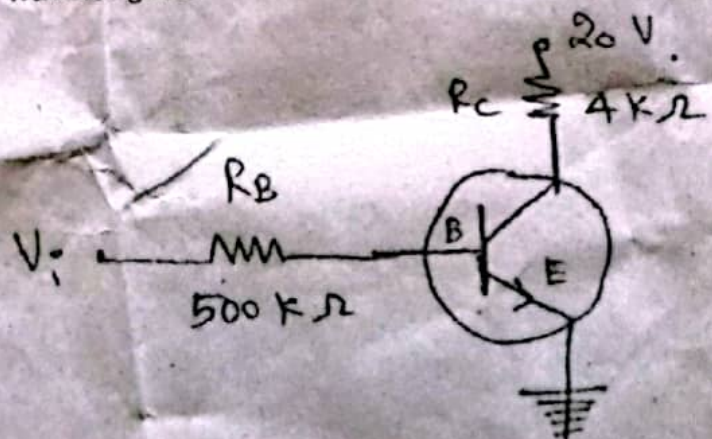
## Part - III

6 × 3 = 18

III. Answer any 6 questions. (Q.No.33 is compulsory)

25. Explain the conversion of galvanometer into voltmeter.
26. The resistance of a nichrome wire of  $0^\circ\text{C}$  is  $10\Omega$ . If its temperature coefficient of resistance is  $0.004/^\circ\text{C}$ , find its resistance at boiling point of water. Comment on the result.
27. What are the important inference from the average binding energy curve?
28. What are the advantages and disadvantages of AC over DC?
29. Two light sources of equal amplitudes interfere with each other. Calculate the ratio of maximum and minimum intensities.
30. State and prove De Morgan's theorem.
31. Derive the expression for equivalent capacitance, when capacitors are connected in parallel.
32. Derive an expression for de-Broglie wavelength of electrons.

33. In the circuit shown in the figure, the input voltage  $V_i$  is 20 V,  $V_{BE} = 0 \text{ V}$  and  $V_{CE} = 0 \text{ V}$ , what are the values of  $I_B$ ,  $I_C$  and  $\beta$ ?



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XII Physics

Part - IV

5 x 5 = 25

IV. Answer all the questions.

34. a) Obtain the expression for the induced emf by changing relative orientation of coil with the magnetic field. (Graph not necessary)

(OR)

b) Derive the mirror equation.

35. a) Deduce an expression for the force between two long parallel current carrying conductors.

(OR)

b) Write down Maxwell equation in integral form.

36. a) Describe Davisson-Germer experiment which demonstrated the wave nature of electrons.

(OR)

b) i) Derive an expression for the orbital energy of an electron in hydrogen atom using Bohr theory.

ii) An electron in Bohr's hydrogen atom has an energy of  $-3.4$  eV. What is the angular momentum of the electron.

37. a) Explain the working of the transistor as an amplifier.

(OR)

b) State Gauss's law in electrostatics. Obtain an expression for Electric field due to an infinitely long charged wire.

38. a) Find out the phase relationship between voltage and current in a pure inductive circuit.

(OR)

b) How the emf of two cells are compared using potentiometer.

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