# PHYSICS (042)

# CLASS-XII – (2012-13)

## BLUE PRINT

| S. No. | Unit | VSA (1mark) | SA I (2marks) | SA II (3marks) | Value Based Question (4 Marks) | LA (5marks) | TOTAL |
|---|---|---|---|---|---|---|---|
| 1. | Electrostatics | 1 (1) | 4 (2) | 3 (1) | – | – | 8 (4) |
| 2. | Current Electricity | 2 (2) | 2 (1) | 3 (1) | – | – | 7 (4) |
| 3. | Magnetic effect of current & Magnetism | 1 (1) | – | 3 (1) | 4 (1) | – | 8 (3) |
| 4. | Electromagnetic Induction and Alternating Current | 1 (1) | 2 (1) | – | – | 5 (1) | 8 (3) |
| 5. | Electromagnetic Waves | – | – | 3 (1) | – | – | 3 (1) |
| 6. | Optics | 1 (1) | 2 (1) | 6 (2) | – | 5 (1) | 14 (5) |
| 7. | Dual nature of Radiation and matter | – | 4 (2) | – | – | – | 4 (2) |
| 8. | Atoms and Nuclei | – | – | 6 (2) | – | – | 6 (2) |
| 9. | Electronic Devices | – | 2 (1) | – | – | 5 (1) | 7 (2) |
| 10. | Communication Systems | 2 (2) | – | 3 (1) | – | – | 5 (3) |
| | Total | 8 (8) | 16 (8) | 27 (9) | 4 (1) | 15 (3) | 70 (29) |

**The Question Paper will include value based question(s) to the extent of 3-4 marks.**

## CLASS XII    PHYSICS (Theory)

**Time allowed: 3 hours**                                    **Maximum Marks: 70**

**General Instructions:**

(i)     All questions are compulsory.

(ii)    There is no overall choice. However an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.

(iii)   Questions **1** to **8** are very short answer type and carry **one** mark each.

(iv)     Questions **9** to**16** are short answer type and carry **two** marks each.

(v)      Questions **17** to **25** are short answer type and carry **three** marks each.

(vi)    Question  **26** is a **value based question** and carry **four** marks

(vii)   Questions **27** to **29** are long answer type and carry **five** marks each.

(viii)  Use of calculators is not permitted.

(ix)    You may use the following values of physical constants wherever necessary:

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

$h = 6.626 \times 10^{-34} \text{ Js}$

$e = 1.602 \times 10^{-19} \text{ C}$

$\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$

$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \text{ N m}^2 \text{ C}^2$

Mass of neutron $m_n = 1.675 \times 10^{-27}$ kg

Boltzmann's constant $k = 1.381 \times 10^{-23}$ JK$^{-1}$

Avogadro's number $N_A = 6.022 \times 10^{23}$ /mol$^{-1}$

1. Name the physical quantity whose SI unit is volt/meter. Is it a scalar or a vector quantity?

2. A 60W bulb is connected to 220 V supply. How much current does it draw?

3. A piece of wire is redrawn by pulling it until its length is doubled .Compare the new resistance with the original value.

4. Draw the magnetic field lines representing uniform magnetic field

5. Name and state the law, which gives the direction of induced e.m.f. in electromagnetic induction.

6. What should be the nature of the lens and the position of the object if we want its image to be upright, virtual and magnified by a factor $0 < m < 1$?

7. What do you mean by 'modulation'?

8. Label the unlabeled box in the given figure.
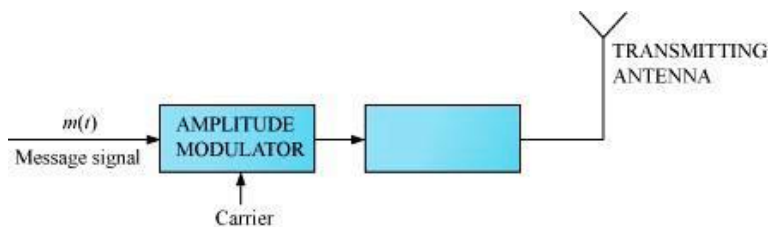


9. Derive the expression for torque, acting on the dipole, placed in a uniform electric field.

10. You are given three capacitors of value 2μF, 3μF, 6μF. With suitable diagram explain how will you connect them to a resultant capacity of 4μF?

11. What is the equivalent resistance between terminals **A** and **C** of the given circuit?
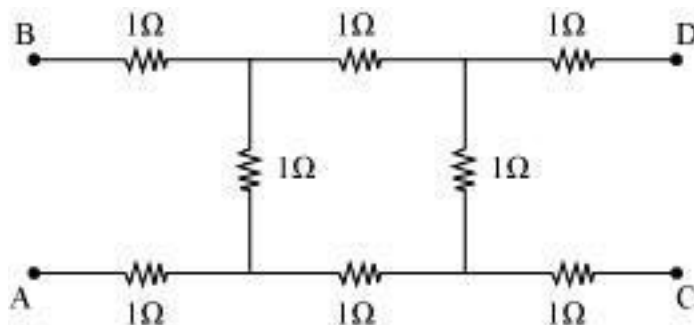
12. An a.c. generator consist of a coil of 50 turns, area 2.5m2 rotating at an angular speed of 60 rad/s in uniform magnetic field of B = 0.3 T between two fixed pole pieces. Given R = 500Ω .
    (i) Find the maximum current drawn from the generator?
    (ii) What will be the orientation of the coil wrt. B to have max and zero magnetic flux?

13. Consider interference between two sources of intensities I and 4I.
    What will be the intensity at points where phase differences is $(1)\ \pi$ $(2)\ \pi/2$

14. Rank the following radiations according to their photon energies:
    **i.** Yellow light
    **ii.** Gamma ray
    **iii.** Radio wave
    **iv.** Microwave

15. An electron and an alpha particle have the same de Broglie wavelength associated with them? How are their kinetic energies related to each other?

16. Draw the logic symbol of a 2-input NOR gate. Write down its truth table.

**OR**

Draw a labelled circuit diagram of n-p-n transistor amplifier in CE– configuration.

17. A 200 V cell is connected to an 8 µF capacitor and removed after the capacitor is fully charged. Also, an uncharged 4 µF capacitor is connected to this 8 µF capacitor in parallel.
    **a.** What is the potential difference across the combination?
    **b.** What is the charge on each capacitor?

18. The ends of a resistance are connected to 19 cells in series, each of internal resistance 0.1 ohm. The current is found to be 2A. The number of cells is reduced to 15 and an extra resistance of 9.5 ohm is connected in series to the given resistance. The current becomes half. Find the given resistance and the emf of each cell.

19. Obtain an expression for the magnetic moment of an electron moving with a speed 'v' in a circular orbit of radius 'r'. How does this magnetic moment change when :

(i) the frequency of revolution is doubled?
(ii) the orbital radius is halved?

20. Find the wavelength of electromagnetic waves of frequency $5 \times 10^{19}$ Hz in free space. Give its two applications

21. Derive Snell's law on the basis of Huygen's wave theory.

22. Explain with reason, how the resolving power of a compound microscope will change when
    (i)    frequency of the incident light on the objective lens is increased.
    (ii)   focal length of the objective lens is increased.
    (iii)  aperture of objective lens is increased.

23. Obtain a relation for total energy of the electron in terms of orbital radius. Show that total energy is negative of K.E. and half of potential energy

24. Draw a curve between mass number and average binding energy per nucleon. On the basis of this curve, explain fusion and fission reactions.

25. With the help of Block Diagram explain how an amplitude modulated wave can be demodulated.

# OR

Explain the following terms :
(1) Ground waves
(2) Space waves
(3) Sky waves

26. *Scientific and logical reasoning is a scientific value expected from students studying Physics. Use your expertise to answer the following question.*

    One way to make a compass is to stick a magnetized needle into a piece of cork and float it in a glass bowl full of water. The needle will align itself with the magnetic field of the earth. Since the north pole of the needle is attracted towards the north, will the needle float towards the northern side of the bowl? Defend your answer.

27. Draw a labelled diagram to explain the principle and working of an a.c. generator. Deduce the expression for emf generated. Why cannot the current produced by an a.c. generator be measured with a moving coil ammeter?

## OR

Explain the principle, construction and working of a transformer. Mention any four causes of energy loss in a transformer.

28. Draw a graph to show the angle of deviation with the angle of incidence i for a monochromatic ray of light passing through a prism of refracting angle A. Deduce the relation

$$n = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

### OR

Define diffraction. Deduce an expression for fringe width of the central maxima of the diffraction pattern, produced by single slit illuminated with monochromatic light source.

29. With the help of circuit diagram of an npn transistor in common emitter mode, explain its use as an amplifier.
Draw the output versus input voltage curve and mark the region in which the transistor is used a (i) switch, and (ii) amplifier.

### OR

Draw forward and reverse characteristic curves of a PN junction diode. Explain briefly with the help of a circuit diagram, how a PN junction diode works as a full wave rectifier. If frequency of input ac signal is 'f' what is the frequency of output.

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