



# ultimate tutorial

Subject: PHYSICS

Branch: Head Office

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Marks: 70

## SECTION - A

- 1 A magnetic field exerts no force on ..... . 01  
[a] Stream of electrons [b] Stream of proton  
[c] Unmagnetised piece of iron [d] Stationary charge.
- 2 By increasing the intensity of incident light on the surface of a metal ..... . 01  
[a] K.E. of photo-electrons increases  
[b] number of emitted electrons increases  
[c] kinetic energy and number of electrons increases  
[d] no effect.
- 3 Dimensions of magnetic intensity is 01  
[a]  $[I^1M^0L^{-1}T^1]$  [b]  $[I^1M^0L^1T^0]$   
[c]  $[I^1M^{-1}L^0T^1]$  [d]  $[I^{-1}M^0L^1T^0]$
- 4 If the length of simple pendulum is halved, its energy becomes: 01  
[a] Twice  
[b] Thrice  
[c] Halved  
[d] Quadrupled.
- 5 The dimensions of the universal gravitational constant are 01  
[a]  $[M^{-1}L^3T^2]$  [b]  $[M^{-2}L^2T^{-2}]$   
[c]  $[M^{-1}L^3T^{-2}]$  [d]  $[M^{-1}L^{-2}T^{-2}]$
- 6 The fundamental frequency of vibrations of a stretched wire is inversely proportional to 01  
[a] the radius of the wire [b] the tension in the wire  
[c] the mass of the wire [d] the ratio of the tension in the wire to the linear density of wire
- 7 Photoelectric effects as explained by 01  
[a] classical theory  
[b] Newton's corpuscular theory  
[c] Huygen's theory of light  
[d] Quantum theory.
- 8 The moment of inertia of a body about the axis of rotation depends upon ..... . 01  
[a] The mass of the body only  
[b] The distribution of mass of the body about the axis of rotation only

[c] Angular speed of the body

[d] Mass and distribution of mass of the body about the axis of rotation.

**SECTION - B**

1 The speed transverse wave along a uniform metal wire when it is under a tension of 1000 gm wt. is 68 m/s. If the density of the metal is  $7900 \text{ kg/m}^3$ , find the area of cross - section of the wire. 02

2 The energy density at a point in a medium of dielectric constant 8 is  $26.55 \times 10^6 \text{ J/m}^2$  calculate electric field intensity at that point. 02

3 Draw the graph of capacitive reactance against frequency of a.c. source. hence discuss its conclusion. 02

4 The angular momentum of a body changes by  $80 \text{ kg m}^2/\text{s}$  when its angular velocity changes from 20 rad/s to 40 rad/s. Find the change in its K.E. of rotation. 02

5 Draw a diagram showing clearly how the coherent sources are produced in a biprism experiment 02

6 Distinguish between insulator, conductor and semiconductor on the basis of energy band structure. 02

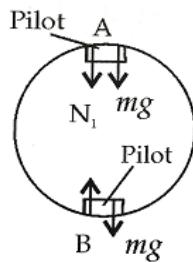
7 Explain the reflection of sound waves from the curved surface. 02

**SECTION - C**

1 Define current ratio  $\alpha$  and  $\beta$  for transistor. obtain the relation between them. 03

2 Describe with the help of neat diagram how will you determine the internal resistance of a cell by using potentiometer, Derive the necessary formula. 03

3 A pilot of mass 50 kg in a jet aircraft is executing a loop-the-loop with constant speed of 250 m/s. If the radius of circle is 50 km, compute the force exerted by seat on the pilot. (a) at the top of loop (b) at the bottom of loop. 03



4 Obtain an expression for the period of a satellite in a circular orbit round the earth. 03

5 Two straight and narrow parallel slits separated by 3 mm are illuminated by a monochromatic light of wavelength  $5460 \text{ \AA}$ . Interference fringes are obtained at a distance of 60 cm from the slit. Find the change in fringe width if distance between slit is (1) increased by 1.5 mm (2) decreased by 0.5 mm. 03

6 Find the longest wavelength in Paschen series if the shortest wavelength in Balmer series is  $3646 \text{ \AA}$ .  $R = 1.097 \times 10^7 \text{ m}^{-1}$ . 03

7 Explain Bohr's second postulate on the basis of De Broglie hypothesis. 03

8 A potentiometer wire has a length 10 m and resistance 20 ohm. Its terminals are connected to a cell of e.m.f. 5V and internal resistance 5 ohm. What are the distance at which null points are obtained when two cells of e.m.f.s 1.5V and 1.3V are connected, so as to (i) assist (ii) oppose each? 03

9 A parallel plate air condenser has a capacity of  $200 \mu\text{F}$ . What will be the new capacity if (a) the distance between the two plates is doubled? and (b) a marble slab of dielectric constant 8 is introduced between the two plates? 03

10 The displacement  $x$  of a particle moving along X-axis is given by  $x = 4 \sin 10\pi t + 3 \cos 10\pi t$ , where  $x$  is in cm and  $t$  is in seconds. Show that the motion is S.H.M. Find the amplitude and period. 03

11 Particle performing S.H.M. starts from extreme position. Plot a graph of displacement, velocity and acceleration against time. 03

#### SECTION - D

1 The length of hour hand of a wrist watch is 1.5 cm. Find the magnitude of (a) angular velocity (b) linear velocity (c) angular acceleration (d) radial acceleration (e) tangential acceleration (f) linear acceleration of a particle on tip of hour hand. 05

Given:  $r = 1.5 \text{ cm} = 1.5 \times 10^{-2} \text{ m}$

$$T = 12 \times 60 \times 60 = 43200 \text{ s}$$

To find: (a) angular velocity ( $\omega$ ) = ?

(b) linear velocity ( $v$ ) = ?

(c) angular acceleration ( $\alpha$ ) = ?

(d) radial acceleration ( $a_R$ ) = ?

(e) tangential acceleration ( $a_T$ ) = ?

(f) linear acceleration ( $a$ ) = ?

2 With a neat labelled diagram, explain the production of amplitude modulation. 05

3 State Einstein's equation of photoelectric effect and explain the characteristics of the effect on the basis of this equation. 05