



# PHYSICS

## BOOKS - UNITED BOOK HOUSE

### QUESTION PAPER 2015

#### Exercise

1. As radio waves of low frequencies cannot be transmitted to long distances, a high

frequency carrier signal is superposed on it.

This process is called

A. Amplification

B. Rectification

C. Modulation

D. Oscillation

**Answer:**



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2. The impurity atom which when added to germanium makes it an n-type semiconductor is

A. boron

B. indium

C. arsenic

D. aluminium

**Answer:**



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3. The total energy of an electron for any particular energy level in hydrogen atom is  $-1.51 \text{ eV}$ . The value of principal quantum number of the energy level is

A.  $n=1$

B.  $n=2$

C.  $n=3$

D.  $n=4$

**Answer:**



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4. The wavelength of matter waves associated with an electron of mass  $m$  having kinetic energy  $E$  is given by

A.  $2 \frac{h}{m} E$

B.  $2mhE$

C.  $\frac{\sqrt{2mE}}{h}$

D.  $\frac{h}{\sqrt{2}} me$

**Answer:**



5. If a light of wavelength  $\lambda$  falling on a single slit of width 'a' at an angle  $\theta$ , the condition of first minima will be

A.  $\lambda \sin \theta = a$

B.  $a \cos \theta = \lambda$

C.  $a \sin \theta = \lambda$

D.  $\lambda \cos \theta = a$

**Answer:**



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6. The refractive index of the material of a double equiconvex lens is 1.5. If the radius of curvature of the lens is  $R$ , then its focal length is

A. zero

B. infinite

C.  $2R$

D.  $R$

**Answer:**



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7. Electromagnetic waves are produced by

- A. a static charge
- B. a uniformity moving charge
- C. an accelerated charge
- D. neutral particle.

**Answer:**





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8. A current flowing through a coil changes from  $+2\text{A}$  to  $-2\text{A}$  in  $0.05\text{ s}$  and an emf of  $8\text{ V}$  is induced in the coil. The value of self-inductance of the coil is

A.  $0.8\text{ H}$

B.  $0.1\text{H}$

C.  $0.2\text{ H}$

D.  $0.4\text{H}$

**Answer:**



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9. an ac having a peak value of 1.41 ampere is used to heat a wire. A DC having a peak value of 1.41 ampere is used to heat wire. A DC producing the same heating rate will be of approximately

A. 1.41

B. 2

C. 0.705

D. 1.0A.

**Answer:**



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**10.** IF current  $I$  flows in a coil of area  $A$  and number of turns  $n$ , the magnetic moment of the coil is

A.  $nIA$

B.  $n^2 l A$

C.  $\frac{nl}{A}$

D.  $\frac{(nl)}{\sqrt{A}}$

**Answer:**



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**11.** A conductor of uniform cross-section is carrying a current of a ampere. The number of free electrons flowing across the across the cross- section of the conduktor per second is

A.  $6.25 \times 10^{18}$

B.  $6.25 \times 10^{17}$

C.  $6.25 \times 10^{16}$

D.  $6.25 \times 10^{23}$

**Answer:**



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**12.** 64 tiny drops of water having same radius and same charge are combined of formone

large drop. The ratio of potential of the large drop to the small drop is

A. 4:1

B. 1:4

C. 16:1

D. 1:16

**Answer:**



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13. The statvolt corresponding to one volt is

A.  $\frac{1}{100}$

B.  $10^9$

C.  $\frac{1}{300}$

D. 300

**Answer:**



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**14.** At what position should an object be placed in front of a spherical mirror such that the size of the image is equal to that of the object?



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**15.** What is meant by accommodation of human eye?



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16. Write down the equation of Lorentz force acting on a moving charged particle.



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17.  $\alpha$ - particle and (ii)  $\beta$  particle are both projected with the same velocity  $v$  perpendicular to the magnetic field  $B$ . Which particle will experience greater force?



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**18.** Prepare the truth table of a two input NAND gate.



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**19.** Which physical quantity has the unit  $\text{Wb}/\text{m}^2$ ? Is it a scalar or a vector quantity?



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**20.** An ac voltage  $e = E_0 \sin \omega t$  is applied across an ideal inductor of self inductance  $L$ . Write

down the peak current.



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21. Establish the relation between drift velocity of electron and current density in metallic conductor.



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22. Why is potentiometer converted for the measurement of emf of a cell? Explain.



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**23.** How is a galvanometer converted into a voltmeter?



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**24.** The Plane of a suspended current carrying rectangular coil makes an angle  $\theta$  with the direction of uniform magnetic field. Calculate the torque acting on the coil.



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**25.** Draw the variation of binding energy per nucleon with mass number of atoms and indicate the stable and unstable regions of the diagram.



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**26.** State Bohr's quantum condition in connection with the hydrogen atom. What is the value of Bohr's radius in SI system?



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**27.** Write down different modes by which electromagnetic waves can propagate from transmitting to receiving antenna. Mention one important use of microwaves.



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**28.** Draw a neat diagram of amplitude modulated waveform. Write down the

expression of modulation index and show each term in the diagram.



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**29.** Define electric dipole moment. Find the torque acting on a dipole when it is placed in a uniform electric field  $\vec{E}$ .



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**30.** State Gauss's theorem in electrostatics.

Find the electric flux through a surface of area

$50\text{m}^2$  in x-y plane in the electric field

$$\vec{E} = 3\hat{t} + 2\hat{t} + k\hat{t} \text{ V/m.}$$



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**31.** What is understood by capacitance of a

capacitor? A 900 pF capacitor is charged to 100

V by a battery. How much energy is stored in

the capacitor?







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**32.** Define angle of dip at a place. What will be the value of the angle at the poles and the equator of the earth? At what place on the earth's surface will the horizontal component of the earth's magnetic field and its vertical component be equal?



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**33.** State Ampere's circuital law. Using this law obtain an expression for the intensity of the magnetic field on the axis of a toroidal solenoid for a current of  $I$  ampere.



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**34.** What are coherent sources? Green light of wavelength  $5100 \text{ \AA}$  is incident on a double slit. IF the overall separation of 10 fingers on a

screen 200 cm away from the slits is 2, find the distance between the slits.



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**35.** What is understood by diffraction of light?

In a single slit experiment, if the width of the slit increases, what will be the change of angular width of the central maxima? State Brewster's law.



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**36.** Define angle of deviation. Show that angle of deviation in case of refraction of light through a prism is  $\delta = i_1 + i_2 - A$  where the symbols have their usual meanings.



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**37.** Calculate the speed of light in a medium whose critical angle is  $45^\circ$ . Mention two practical applications of optical fibre.



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**38.** What is meant by stopping potential in photoelectric emission? Does the stopping potential depend on the intensity and the frequency of the incident light? Explain.



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**39.** What conclusion is drawn from Davission-Germer experiment? Are matter waves electromagnetic waves? Explain.



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**40.** Write down the relation between radius of the nucleus and mass number of an atom. What is isotone? Give an example.



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**41.** Draw the I-V characteristics of a light emitting diode (LED) and explain its working principle.



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**42.** Draw the output characteristic curves of a n-p-n transistor in a C-E configuration and find the output resistance from it.



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**43.** What is NOR gate? Prepare its Truth Table.  
Why is it called Universal gate?



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**44.** What is Zener diode? Draw its voltage vs current characteristics in the reverse bias and indicate the breakdown voltage on the characteristics. Mention one important use of this diode.



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**45.** With the help of a circuit explain the function of a shunt used in a galvanometer.



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**46.** State Kirchhoff's laws in a network of conductors carrying current. State which law obeys the principle of conservation of energy.



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**47.** Establish the balanced condition of Wheatstone's bridge by applying Kirchhoff's laws.



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**48.** Length diameter and specific resistance of two wires of different materials are each in the ratio 2:1. One of the wires has a resistance of 10 ohm. Find the resistance of 10 ohm. Find the resistance of the other wire.



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**49.** Define self inductance of a coil.



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**50.** A metallic disc of radius 10 cm is rotating uniformly about a horizontal axis passing through its centre with angular velocity 10 revolution per second. A uniform magnetic field of intensity  $10^{-2}$  Tesla acts along the axis of the disc. Find the potential difference induced between the centre and the rim, of the disc.



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51. The instantaneous voltage from an ac source is given by  $e=200 \sin 314t$  volt. Find the rms voltage. What is the frequency of the frequency of the source?



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52. State the condition under which the phenomenon of resonance occurs in series LCR circuit when ac voltage. Calculate the value of self-inductance if the capacitor used is

$10\mu F$  and resistance used is 10 ohm with the ac source of frequency 50 Hz.



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**53.** Focal lengths of two thin lenses kept in contact are  $f_1$  and  $f_2$ . Prove that their equivalent focal length  $f$  is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$



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**54.** The refracting angle of a prism is  $60^\circ$  and the refractive index of its material is  $\sqrt{\frac{7}{3}}$ .

Find the minimum angle of incidence of a ray of light falling on one refracting face of the prism such that the emerging ray will graze the other refracting face.



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**55.** The object and the image are at distances  $x$  and  $y$  respectively from the focus of a concave

mirror. Establish the relation between  $x$ ,  $y$  and the focal length  $f$  of the mirror.



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**56.** Light from a point source placed at the bottom of a rectangular glass slab of thickness 5 cm is internally reflected by the upper surface and a circle of radius 8 cm is formed at the bottom. Find the R.I. of glass.



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