INDIAN SCHOOL MUSCAT

DEPARTMENT OF PHYSICS

RAPID REVISION (2017-2018)

CLASS XII

IMPORTANT SHORT & VERY SHORT ANSWER QUESTIONS WITH ANSWERS

AN EDUCATION ISN'T HOW MUCH YOU HAVE COMMITTED TO MEMORY, OR EVEN HOW MUCH YOU KNOW. IT'S BEING ABLE TO DIFFERENTIATE BETWEEN WHAT YOU KNOW AND WHAT YOU DON'T.

ANATOLE FRANCE

1. Electrostatics

1.In a parallel plate capacitor the capacitance increases from 16μF to 80μF on introducing a dielectric medium between the plates. What is the dielectric constant of the medium ?

K = Cm/Ca = 80/16 = 5

2. The force between two point charges kept at a distance of r apart is F. If the same charges are kept in water at the same distance, how does the force between them change?

Fa/Fw = K , Fw/Fa = 1/K =1/81

3. Under what conditions The electric field intensity due to two point charges be zero at a point in the line joining the two charges but the point should not be between the charges ?

The two charges should be of opposite charges and they should have different magnitudes.

4. How much work is done in moving a 500μC of charge between two points on an equipotential surface at a potential of 4V?

Zero. Work done in moving a charge along an equi potential surface is zero .

5. Define dielectric field strength .

It is the maximum electric field strength a medium can withstand before break down.

6. Define equi potential surface. Can two equi potential surfaces intersect?

If all the points on a surface are at the same potential such a surface is equi potential surface. Two equi potential surfaces cannot intersect if they intersect , two electric field lines must intersect which is not possible.

7. If the plates of a parallel plate capacitor are connected to each other by a copper wire, what will happen?

The charge will flow from positive to negative plate and the capacitor will be discharged completely. So the energy stored is dissipated as heat energy.

8. The plates of a charged parallel plate capacitor are connected to a volt meter , what will be the effect of increasing the separation between the plates on the voltmeter reading?

Voltmeter reading increases.

9. A very thin metal plate of thickness t << d is kept in the middle of a parallel plate capacitor .What will be the effect on the capacitance of the system?

No change in the capacitance.

10. A 12pF capacitor is connected to a 50V supply. Calculate the electrostatic energy stored in the capacitor.

$U = ½ CV^2 = 1.5 \times 10^{-8} J$

11. How does the electric field inside a dielectric change when it is placed in an external electric field?

It decreases as the induced electric field is opposite to the applied field. Net electric field decreases.

12.The energy stored in a a capacitor of capacitance C is U ,Express the charge Q stored in it in terms of C and U.

Q= √(2CU)

13. What is the function of dielectric in a capacitor?

It increases the capacitance by reducing the effective potential difference between the plates.

14. A hollow metal sphere of radius 5cm is charged such that the potential on its surface is 10V. what is the potential at the centre of the sphere?

10 V. Potential inside a hollow metal surface is equal to its potential on the surface.

15.Can there be a potential difference between two adjacent conductors carrying the same charge?

Yes , if their sizes are different.

16. What is the geometrical shape of equi potential surfaces due to a single isolated charge?

Spherical for q>0 and q<0.

17.Name a Physical quantity whose SI unit is i) J/C ii) J /m^3 iii) Volt /m , State whether it is a scalar or vector quantity?

i) electric potential – scalar ii) energy density – scalar iii) electric field strength – vector

18.What is the dielectric constant of a metal?

Infinity , as the electric field inside a conductor (metal) is zero

19.Why is the potential inside and on the surface of hollow conducting sphere same and remains constant?

dV = -**E.dl** since electric field inside the conductor is zero dV = 0 V is constant.

20. State the differences between electric potential at a point due to a single point charge and an electric dipole.

NO	V due to a single point charge	V due to an electric dipole
1	Inversely proportional to r the distance from the point	Inversely proportional to r^2 the distance from the point
2	Does not depend on the angle between the line joining the point from the charge and the axis on which the point charge is located.	depend on the angle between the line joining the point from the centre of the dipole a of the dipole and the axis of the dipole

21. State a similarity and a difference between the mass and charge of a particle.

Similarity : both are scalars

Only charge is quantised mass is not quantised . charge can be negative ,positive and zero but mass is a positive quantity.

22. a charge q is placed inside a cube what is the electric flux through the i) entire cube ii) one of its face?

i) $\Phi = \frac{q}{\varepsilon 0}$ ii) $\Phi = \frac{q}{6\varepsilon 0}$

23. Why should a circuit containing a capacitor must be handled cautiously even when the circuit is off?

Even when the circuit is off the capacitor might be fully charged , when we touch it we will get severe electric shock.

24. what is the net charge on i) a charged capacitor ii) an electric dipole?

i)zero ii) zero

25. Two spheres of different capacitances are charged to different potentials . When you join them by a copper wire , what happens to the total energy? Explain .

The energy will decrease and the difference in energy appears as heat in the wire.

2. Current Electricity

1. What will be the effect of the following on drift velocity of electrons in a metallic conductor i) heating the conductor ii) doubling the length of the conductor?

i) Decreases ii) v_d will reduce to half the original value.

2. On increasing the current drawn from the cell, how does the terminal pd across the cell change?

Decreases.

3. What is the effect of increasing electric field on the following i)drift velocity ii) mobility of electrons in a conductor?

i) increases ii) no change.

4. Which among the following is/ are vector(s)? electric current, electric field , current density, potential difference?

electric field , current density

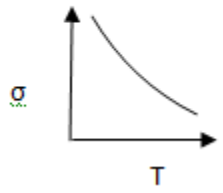
5. Write the expression to show the dependence of resistivity ρ on temperature.

$\rho_t = \rho_0 (1+\alpha (t-t_0))$

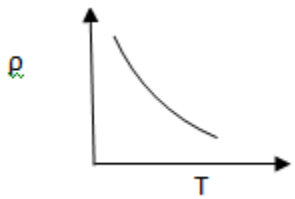
6. How does the conductivity of a i) good conductor ii) semiconductor change when the temperature increases?

i) decreases ii) increases.

7. Draw a graph to show the variation of conductivity σ of a conductor with temperature T.



8. Draw a graph to show the variation of resistivity ρ of i) a semiconductor ii) carbon with temperature T.



9. Why material of high resistivity is preferred for bridge wire in metre bridge & potentiometer?

To make it compact. Otherwise the bridge will be several metres in length.

10. Name the conservation laws obeyed by Kirchoff's I & II laws.

I law – law of conservation of charge, II law- law of conservation of energy

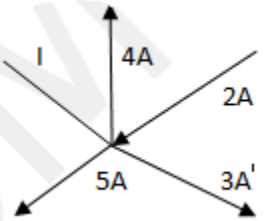
11. In meter bridge experiment how would the balancing length change if we interchange the battery and the galvanometer with each other ?

No change as the wheatstone's bridge is not disturbed condition for the balance is unchanged.

12. A uniform conducting wire of resistance 50Ω is cut into 5 segments of equal lengths. If the five segments are connected in parallel , what would be the new resistance?

Resistance of each segment is 10Ω. Rp = R/n = 10/5 = 2Ω

13. What is the value and direction of current I in the given current distribution?



I = 10A , coming towards the junction, using Kirchoff's Junction rule.

14. Is it possible to have terminal pd of a cell i) equal to zero ? ii) greater than emf of the cell?

Yes i) when the cell is short circuited ii) when the cell is being charged by an external dc source.

15. Which is preferred a voltmeter or potentiometer to measure emf of a cell , Why?

potentiometer is used to measure emf of a cell because it does not draw current from a cell as it uses null deflection method.

16. Arrange copper, carbon, nichrome in increasing order i) their resistivities ii) temperature coefficient of resistance.

i) carbon < nichrome < carbon ii) carbon< nichrome < copper

17. How does internal resistance of a cell change when i) temperature ii) concentration increases?

i) increases as mobility of ions increases ii) number density of charges increases.

18. Why the internal resistance of a i) cell must be very low ii) high tension supply must be high?

i) to draw more current from the cell ii) to prevent the flow of a large amount of current in the voltage supply when short circuit takes place.

19. Calculate the resistivity of a conductor in which a current density of 2.5 A/m^2 exist, when an

electric field of 15V/m is applied on it.

P = E/ J = 15/2.5 = 6 Ωm

20. A copper wire is stretched to make it 0.1 % longer .What is the percentage change in resistance?

R= ρ l /A , (ΔR/R) % = (Δl/l) % + (ΔA/A)%

= 2 x 0.1% = 0.2%

21. Why large resistors are made up of carbon filaments?

Due to its large resistivity a small carbon resistor can give large resistance.

22. Carbon and silicon are known to have similar lattice structures . However ,the four bonding electrons of carbon are present in second orbit whilethose of silicon are present in its third orbit. How does thisresult in a difference in their electrical conductivities?

It is easier to eject an electron from the third orbit than from second orbit. So conductivity ofsilicon is more than that of Carbon.

23.Two electrical bulbs whose resistances are in the ratio 1:2 are connected in parallel to a source of constant voltage. What will be the ratio of power dissipation in these wires?

$P\alpha V^2/R$ for same voltage P1/P2 = R2/R1 = 2 : 1

24.Is Ohm's law universally applicable for all conducting elements? If not give examples of elements which do not obey Ohm's law.

No It is applicable for elements for which V-I characteristics is linear. Example for Non ohmic devices Semiconductor diode, transistor.

25.Given n identical resistors each of resistances R, how will you combine them to get i) maximum resistance ii) minimum resistance ? iii) give the ratio of maximum to minimum resistance.

i) series combination ii) parallel combination ii) Rmax =nR Rmin = R/n Rmax/Rmin = n^2

3 .Magnetism & Magnetic effects of electric current

1. Where is the value of dip angle i) maximum ii) minimum ?
dip angle is 90◦ and maximum at poles. dip angle is 0◦ and minimum at equator.
2. Which among the following Aluminium , Bismuth , and Iron can become super conductor when cooled to a low temperature? Why?
Bismuth, as it is a diamagnet.
3. Arrange the following three a galvanometer, an ammeter and volt meter both made from identical galvanometers in increasing order of resistance?
ammeter , galvanometer , volt meter
4. A thin wire is made in the form of a loop of irregular shape. What will you observe when it is placed in a uniform magnetic field?
Its shape changes to circular. For a given perimeter a circle has more area .This is to increase the magnetic flux.

5. Which of the following a proton or a beta particle will describe the smallest circle when projected with same velocity perpendicular to the same magnetic field?

Beta particle as its mass is the least.

6. A charged particle enters in a uniform magnetic field at angles i) 75◦ ii) 90◦ predict the path travelled by them.

helical path , circular path

7. What is the value of magnetic field within a hollow sphere made of a ferromagnetic substance? Mention one application for it.

zero. It gives magnetic shield for any device to be protected from magnetic effects.

8. Which among the following antimony, aluminium, iron has Maximum value of magnetic susceptibility?

Iron as it is a ferro magnet.

9. What is the effect of increasing the number of turns of the coil in a galvanometer on i)current sensitivity ii) voltage sensitivity?

i) increases ii) no change

10. An electron beam projected along +ve X axis, experiences a force due to magnetic field along the +ve Y axis .What is the direction of the magnetic field?

Negative z direction.

11. A bar magnet of magnetic moment M is divided into n parts. Will each part be a magnetic dipole ? What will be the dipole moment of each part.

Yes. M' = M/n

12. If a compass box and a dip circle were to be taken to the magnetic north pole of earth, what would you observe with regard to directions of their respective needles?

Compass needle would point an arbitrary direction , needle of dip circle points 90◦

13.Explain why i) steel is preferred for making permanent magnet ii) soft iron is preferred for making electro magnet iii)) soft iron is preferred for making core of a transformer.

Due to i) its high coercivity and retentivity ii) its less coercivity and retentivity iii) its less hysteresis loss.(area of hysteresis loop is small)

14. An electron beam passes through a region of crossed electric and magnetic fields of strengths E and B respectively .For what value of electron speed the speed of electron beam will be un deflected?

$Bqv = qE \quad v = E/B$

15.What is the advantage of radial magnetic field in a galvanometer?

It makes the torque maximum and the relation between current and θ becomes linear

16.Horizontal component of earth's magnetic field at a place is $\sqrt{3}$ times the vertical component ,what is the angle of dip at that place?

$\tan \delta = B_V/B_H = 1/\sqrt{3}$ $\delta = 30^\circ$

17.Vertical component of earth's magnetic field at a place is $\sqrt{3}$ times the Horizontal component ,what is the angle of dip at that place?

$\tan \delta = B_V/B_H = \sqrt{3}$ $\delta = 60^\circ$

18. A current is set up in a copper pipe. Is there a magnetic field i) inside ii) outside the pipe ?

i) magnetic field inside is zero ii) $B = \frac{\mu 0 I}{2\pi r}$

19. A loop of irregular shape carrying current is located in an external magnetic field . If the wire is flexible why does it change to circular shape?

The loop of irregular shape of flexible wire attain circular shape with its plane normal to the magnetic field to minimise its potential energy since for a given perimeter a circle has maximum area.

20.Two streams of electrons of same number of electrons are moving parallel to each other in the same direction. What type of force is existing between them?

Repulsive force due to like charges . As they are conisidered as straight conductors carrying current through them magnetic force acts. Electrostatic force is greater in magnitude. Net force is electrostatic and repulsive.

21.State two differences between force due to magnetic field and force due to electric field on a charged particle.

S.No	force due to electric field	force due to magnetic field
1	It acts on charge at rest as well as on moving charge	It acts only on charge in motion not parallel to magnetic field
2	It accelerates a charged particle	It changes the direction of motion of a particle

3	There is a change in kinetic energy	There is no change in kinetic energy

22. How does the magnetic moment of a bar magnet change when it is divided into two equal parts i) along its length ii) transverse to its length .

i) M =2lm m pole strength , M magnetic moment of bar magnet

along the length l′ = l ,m′ =m/2 M′ = 2lm/2= lm

transverse to the length l′ = l/2 ,m′ =m M′ = lx m

in both the cases M′ = M/2

23. What is an ideal voltmeter?

It is a volt meter of infinite resistance so that it draws least current

24. What is an ideal ammeter?

It is an ammeter of almost zero resistance.

25. What is the role of i) magnetic field ii) high frequency oscillator in a cyclotron?

i) to provide centripetal force for the positively charged particle.

ii) to change the polarities of the two dees after each half revolution so that the charged particles is accelerated.

4 . Electromagnetic induction and Alternating current

1. Two identical loops ,one of copper and another of constantan are removed from a magnetic field with in the same interval , in which loop will the induced current be greater?

Copper wire as it is a conductor.

2. In an LR series circuit the pd across R is 60V and that along the inductor 80V what is the effective emf of the circuit?

100V

3. The power factor of an AC circuit is 0.5. What is the phase difference between the current and voltage?

π/3 rad

4. What is a choke coil? Mention its use.

Choke coil is a coil of high inductance and negligible resistance. It is used to control ac current with negligible power loss because power factor of choke coil is negligible. It is used to protect fluorescent lamps.If pure resistance is used in ac circuit, it will absorb the maximum power because power factor of resistor is maximum equal to 1.

5. The instantaneous current and voltage of an ac circuit are given by i=10 sin314t A,
v=50 sin314t V. What is the power dissipation in the circuit?

Current is in phase with Voltage, therefore cosØ = 1

Power P =1/2 $V_0 I_0 \cos\emptyset$ = ½ x 50 x 10= 250

6. The electric mains in a house is marked 220V, 50Hz. Write down the equation for instantaneous voltage.

$V= V_0 \sin\omega t$, $V_0 = 220\sqrt{2}$

$V=220\sqrt{2} \sin 2\pi \times 50t = 310 \sin 314t$

7. The frequency of ac is doubled, what happens to i) inductive reactance ii) capacitive reactance?

i) inductive reactance $X_L = 2\pi\nu L$, it is doubled

ii) capacitive reactance $X_C = 1/2\ \pi\nu C$, it is halved

8. What is the origin of displacement current?

Displacement current is due to time varying electric flux between the plates of a capacitor. $I_d = \varepsilon_0 \times d\emptyset_E / dt$.

9. Which effect of electric current does not depend on direction of current flow?

Heating Effect

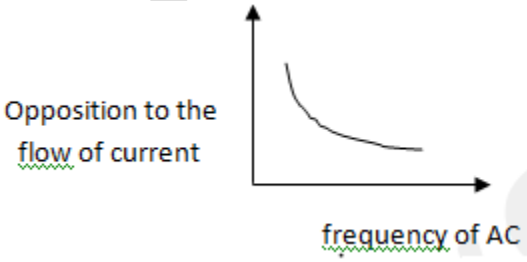
10. Mention 2 uses of eddy currents.

It is used in i) induction furnace ii) speedometer iii) brakes in electric train.

11. When a bar magnet is dropped through a copper tube what happens to its acceleration?

Its acceleration decreases due to the formation of eddy currents.

12. From the graph given below find the circuit element. What is the phase relation between current and voltage in that circuit ? what is the power dissipated in the circuit?



The circuit element is a capacitor. Current leads voltage by $\frac{\pi}{2}$. zero as cos $\frac{\pi}{2}$ is zero.

13. What is Q factor in an LCR circuit at resonance? What is its importance?

If Q factor is large the sharpness of resonance is better.

Q= voltage across L or C / voltage across R = $L\omega/R = \frac{1}{R}\ \frac{\sqrt{L}}{\sqrt{C}}$

14. Mention any four characteristics of an LCR circuit at resonance.

Impedance Z is minimum Z=R ,Current I is maximum

There is no phase difference between current and voltage.

Power factor is one.

15. Current in a circuit falls from 5.0 a to 0 A in 0.1 s . If an average emf of 200 V is induced calculate the self inductance of the circuit.

(dI/dt) = 50A/s

e = L (dI/dt) L= e/ (dI/dt) = 200/50 = 4 H

16. The current flowing through a pure inductance of 2mH is i= 15 cos 300t A. What is the i) rms and ii) average value of current for complete cycle of AC?

Io = 15 A

Irms = Io/√2 = 15//√2 A ,Iav = 0

17. Define the term 'wattless current'.

In an LCR circuit with pure inductor or capacitor there s a flow of current without dissipation of energy, Such a current is know as wattless ccurrent.

18. What is the use of choke coil ?

Iron core choke coil is used to control the current in a fluorescent lamp, also as it as very less resistance it consumes less power.

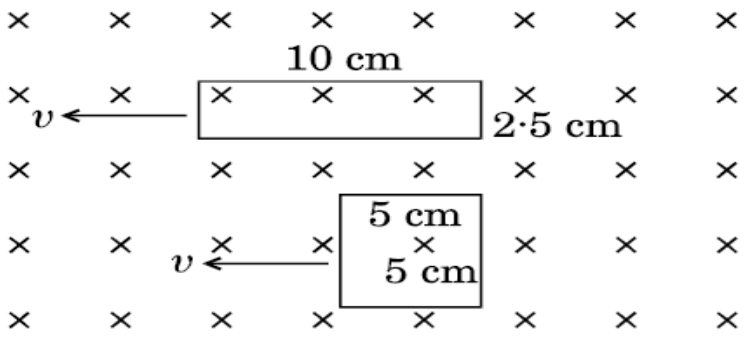
Air core choke coil is used

18 Two loops, one rectangular of dimensions 10 cm × 2·5 cm and second of square shape of side 5 cm are moved out of a uniform magnetic field $\vec{B}$ perpendicular to the planes of the loops with equal velocity υ as is shown in the figure.

(i) In which case will the emf induced be more ?

(ii) In which case will the current flowing through the two loops be less ?

Justify your answer.



Induced emf is the same in both the loops. Induced current is more in square loop.
Emf E depends on area of the loops . Current is less in rectangular loop as its resistance is more due to its length

19.If the coefficient of mutual induction of a pair of coils is 6H and a current of 5 A is cut off in $\frac{1}{5000}$ of a second calculate the emf induced in the coil.

e = $-M\ \frac{dI}{dt}$ = - 6 x- $\frac{1}{5000}$ x 5 = 15 x 10^4 V

20. The resistance of a coil of number of turns for dc current is 10Ω. When an alternating current is passed through it will the opposition to the flow of current increase ,decrease or remain the same?
The coil has inductance also when AC is passed through it , it offers inductive reactance in addition to resistance .Therefore its opposition to the flow of current will increase .

21. The frequency of ac source is doubled how does its i) capacitive reactance ii) inductive reactance change?

i) It will be halved ii) it will be doubled.

22. The south pole of a magnet is brought near a conducting loop. What is the direction of induced current as observed by a person on the other side of the loop?
Other side will be north pole according to Lenz law, therefore direction of the induced current is anticlockwise.

23. A lamp is connected in series with a capacitor predict your observations for DC and AC connections. What is the effect of i) increasing the frequency of AC ii) reducing the capacitance on the brightness of lamp?

With dc the bulb will not glow as capacitive reactance for dc is infinity. With ac the bulb glows. i) As frequency increases capacitive reactance decreases and impedance decreases and the current increases so the bulb glows brighter. ii) as C decreases capacitive reactance increases and impedance increases and the current decreases so the bulb glows with less brightness.

24. A bulb B and an inductor L are connected in series to the AC mains. The bulb glows with some brightness. How will the glow of the bulb change when a i) a soft iron core ii) bismuth core is introduced inside the inductor? Give reasons.

i) inductive reactance increases as soft iron is ferromagnetic and impedance increases and the current decreases so the bulb glows with less brightness. ii) inductive reactance decreases as bismuth is diamagnetic , impedance decreases and the current increases so the bulb glows brighter.

25. Mention any four power losses in a transformer.

Eddy current loss ,Copper loss , hysteresis loss , flux loss.

5 .Electromagnetic Waves & Communication Systems

1. Identify the following electromagnetic waves as per the wavelengths given below
a)10^{-3}nm b)10^{-3}m c)1nm.Write one application for each of them.

a) gamma radiation ,treatment of cancer .b) microwaves , RADAR for air craft navigation

c) X rays, detection of fracture of bones , concealed contra band goods at air ports.

2. A plane electromagnetic wave travels in vacuum, along Y direction . Write down the ratio of magnitudes and ii)the direction , of its electric and magnetic field vectors.

i) E/B =C= 3 x10^8 m/s ii) **E** along z direction, and **B** along x direction.

3.Name the following constituent radiations of electromagnetic spectrum which i) produce intense heating effect ii) is absorbed by ozone layer in the atmosphere.iii) used to study crystal structure. Write one application of each of them.

i) Infra red rays, used for taking photographs during fogs ii) UV rays , used to sterilize surgical instruments iii) X RAYS, used in detection of fracture of bones , concealed contra band goods at air ports

4.In a plane electromagnetic wave , the electric field oscillates with a frequency of 2 x 10^{10}Hz , and amplitude of electric field is 40V/m, calculate its wavelength and amplitude of magnetic field.

$\lambda = C/v = 1.5cm$, $B = 7.5 \times 10^{-6}$ T

5. The Ozone layer on the top of stratosphere is crucial for human survival, why?

It absorbs the UV rays, and other low wavelength radiations which are harmful to living cells of human beings.

6. A radio can tune any station in the 7.5MHz to 12 MHz. What is the corresponding wavelength band?

$\lambda = C/v$ $\lambda 1 = 3 \times 10^8 / 7.5 \times 10^6 = 40m$, similarly $\lambda 2 = 25m$

7. Why the frequency of ground waves cannot exceed 1.5MHz or 1500 kHz ?

ground waves are attenuated by earth's surface , the attenuation increases with frequency so the frequency of ground waves cannot exceed 2MHz.

8. Name a component of electromagnetic waves which travels with same speed in any medium but blocked by bone.

X rays.

9. Why transponder should receive signal at one frequency and retransmit at another frequency?

It is to prevent cancellation of the signal by destructive interference with the retransmitted wave.

10. Why the value of modulation index cannot exceed 1?

It is to avoid the distortion of the signal.

11. Micro wavesare used in RADAR , why?

Due to their short wavelengths ,micro waves can be transmitted as well directed beam for long distances

12. Mention one advantage and one limitation of FM over AM .

Advantage of frequency modulation.

It is free of noise.

Limitation of frequency modulation

It requires complex and expensive system for transmission

.

13. Give two examples of communication system which use space waves.

i) television transmission ii) satellite communication

14.Why is the amplitude of modulating signal kept lower than that of carrier wave?

It is to keep modulation index less than one , which prevents the distortion of signal.

15.Why short wave band is used for long distance radio broad cast ?

As they are sky waves reflected by the ionosphere , they can be used for long distance radio broad cast.

16. What is the range of frequencies used for T.V transmission ? What is common between them and light waves?

76MHz to 88MHz . Their speed is same

17.Why communication using LOS mode is limited to frequencies above 40MHz?

The direct waves get blocked by the curvature of earth , when the signal is to be received beyond horizon the height of the receiving antenna must be very high.

18. Distinguish between 'Analog and Digital signals'

A signal that varies continuously with time (eg. Sine wave form) is analog signal

A signal that is discrete and can have a value 1 which denotes its presence and a value 0 that denotes its absence .

19. Name the type of the communications that uses carrier waves having frequencies in the range 10^{12} to 10^{16} Hz.

Optical communication.

20. Give three reasons for modulating the signals.

i) to reduce the size of antenna to be practicable size .

ii) to avoid inter mixing of various signals

iii) to increase the power of transmitted signals

21. Why in satellite communication the uplink and down link frequencies must be different?

It is to prevent destructive interference signal received by the transponder of the satellite and the signal retransmitted from it.

6. Ray Optics & Wave Optics

1. The refractive index of a material is √3. What is the angle of refraction if un polarised light is incident on the material at polarizing angle?

$\mu = \tan i_p$ $\sqrt{3} = \tan i_p$, $i_p = 60^\circ$, $i_p + r = 90^\circ$, $r = 30^\circ$

2. Is dispersion possible in a hollow prism ? Justify.

No. Because both the refracting sides act like two glass plates .So after refraction from both the plates the emergent ray is parallel to the incident ray.

3. The objective of telescope A has a diameter thrice that of the objective of telescope B . Compare the ratio of light gathered by A and B.

Intensity $\alpha\ d^2$, $I_A/I_B = (d_A / d_B)^2 = 9 : 1$

4. Two slits in Young's double slit experiment are illuminated by two different lamps emitting same wavelength. Will you observe interference pattern? Justify.

No. Even though wave lengths are equal, the lamps emit waves at different phase. so the sources are not coherent .

5. How does the resolving power of a compound microscope change when i) cedar wood oil is filled in the space between object and objective lens? ii) If yellow light is replaced by blue light for illumination?

R.P = $2\mu\sin\theta/1.22\lambda$, i) as μ increases .R.P increases ii) as λ decreases R.P increases

6. Two telescopes have the same magnifying power, but the diameters of their apertures are different. Will there be a difference between the final images produced ?

yes. The final image produced in a telescope with more aperture will be bright and finer details of the image can be seen as resolving power is more in it.

7. For which colour blue or red the focal length of a convex lens will be more? What will be your answer if the lens is concave?

The focal length is more for longer wavelength red in both convex and concave lenses.

8. An equi convex lens has a refractive index of 1.5 . write its focal length in terms of radius of curvature.

R1 =R2 =R , for equi convex lens ,$1/f = (1.5 -1)(1/R + 1/R) = 1/R$, ie f =R

9. What type of an air bubble inside water ?

Diverging lens, as ,$\mu_{lens} < \mu_{medium}$ from lens makers formula f will be negative.

10. State the essential condition required for diffraction to take place .

The width of the slit must be small are comparable with the wave length of light is used.

11. A convex lens of a material of refractive index μ is placed in a transparent liquid . What would be the value of refractive index of the liquid more, less or equal to μ ?

Equal to μ. From lens makers formula.

12. Name the type of wave front from a i) line source ii) point source at infinite distance.

i) cylindrical wave front ii) plane wave front

13. Can sound waves be polarized ? Justify.

No. Longitudinal waves cannot be polarised

14. To get a sharp image, which concave mirror you will prefer one with small aperture or large aperture?

The one with small aperture.

15. A concave mirror & a convex lens are held under water. What would be the change in their focal lengths?

In concave mirror no change but in convex lens focal lens increases.

16. Mention advantages of total reflecting prism over mirrors or spherical metallic reflectors.

(i)The light is totally reflected so the image is bright.(ii)There is no tarnishing of reflecting surfaces.

17. What is the focal length and power of plane glass plate?

Focal length is infinite. Power is zero.

18. Why sunglasses have zero power even though their surfaces are curved?

Both the surfaces are curved in the same direction & the curvature is same for both the surfaces.

Power $P = (\mu-1)(1/R-1/R) = 0$

19. A glass slab is placed over a page in which letters are printed in different colours. Which colour letter blue or red will be maximum raised?

Blue, as its wavelength is less. Apparent depth of blue colour is less

20. Name the phenomenon of light which could not be explained by wave theory.

Photoelectric effect.

21. Identify the phenomenon of light from the clues given below

i) principle of working of optic fibres ii) it proves transverse nature of light.

iii) bending of waves at the edges of obstacles iv) causes colours in thin films of oil on rain water.

22. State Rayleigh's law of scattering

Amount of light scattered is inversely proportional to the fourth power of wavelength of light.

23. What is the refractive index of the material of a biconvex lens if its focal length is numerically equal to of magnitude of radii of curvature.

n =1.5.

24. Mention two advantages of reflecting telescope over refractive telescope.

Since the objective is mirror chromatic aberration is avoided

Mechanical equilibrium is ensured.

25. Why magnification by a simple microscope cannot exceed 9?

The lens cannot be designed below a particular focal length .

7 .Dual Nature of Matter & Photoelectric Effect 8. Atoms and Nuclei

1. Threshold wavelength of certain material is $5000A^{O}$. Will photoelectric emission take place when the material is illuminated by UV lamp of power 8.3W?

Yes, because λ of UV RAYS is less than $5000A^{O}$.

2. A source of light is placed at a distance r from a photoelectric cell. What would be the effect of doubling the distance r on i)photoelectric current ,ii) cutoff potential?

Doubling the distance r will make the intensity ¼ th i) photoelectric current also becomes ¼ th

ii) no change in cut off potential as it is independent of intensity.

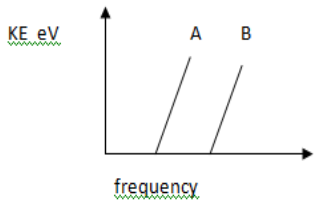
3. An electron and a proton have same kinetic energy which of them will have greater deBroglie wave length?

As the kE is same electron will have less momentum due to its less mass , so it will have greater deBroglie wavelength , as $\lambda = h/p$.

4. An electron and a proton have same momentum which of them will have greater deBroglie wave length?

Both will have same deBroglie wave length, as $\lambda = h/p$.

5. The graph shows the variation of kinetic energy of photoelectron emitted with the frequency of incident radiation for two photosensitive materials A and B .Find which of them will have i) more threshold wavelength ii) more work function iii) electrons emitted with more kinetic energy for same incident radiation of suitable frequency and intensity ?

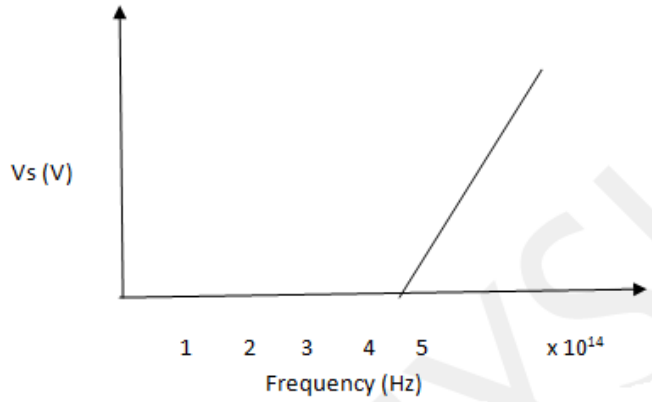


i) A ii) B iii) A

6.Two metals A and B have work functions 2eV and 4eV respectively, which metal has lower threshold wavelength?

B, since its work function and threshold frequency are more.

7. From the graph given below for sodium calculate the i) the threshold frequency ii) work function for sodium.



Take h = 6.6 x10^{-34} Js

i) ϑ_0 = 4.5 x 10^{14} Hz ii) W = h ϑ_0 / e= 1,85 eV

8.An electromagnetic wave of wavelength λ is incident on a photosensitive surface of negligible work function.If the photo electrons emitted from the surface have the same deBroglie wavelength λ_B prove that $\lambda = \frac{2mC}{h}\lambda_B^2$

Ek= $\frac{hC}{\lambda}$ (i) $\lambda_B = \frac{h}{\sqrt{2m\text{Ek}}}$ $\lambda_B^2 = \frac{h2}{2m\text{Ek}}$ (ii) sub (i) in (ii) and simplifying $\lambda = \frac{2mC}{h}\lambda_B^2$

9. The radius of the first orbit of an electron in Hydrogen atom is 0.53A^0. What is the radius of second orbit?

$r_2 = 4r_1$, r_2 = 4 x 0.53A^0 = 2.12 A^0 .

10. Name the spectral series of Hydrogen in i)visible region ii) UV region

i) Balmer series ii) Lyman series

11. What is the physical meaning of negative energy of an electron?

The electron is bound to the atom.

12. How does n/p ratio of a nucleus change in β emission?

In negatron emission n/p ratio decreases. n/p ratio increases in positron emission.

13. The half life of radium is 1600years. After how many years the remaining sample will be 25% of its initial amount?

$N/N_0 = (½)^n$, where n is number of half lives here $N/N_0 = (½)^2$ n= 2 ,

total time = n x half life = 2 x1600 = 3200 years

14. What type of spectrum is emitted by i) α particle ii) β particle ?

i) line spectrum ii) continuous spectrum.

15. Name a material which can be used as a moderator, coolant and neutron reflector.

heavy water (D_2O)

16. Name the most stable nuclei. Which among the following Lithium & plutonium may undergo nuclear i) fission ii) fusion?

$_{26}Fe^{56}$, i) Plutonium ii) Lithium

17. Name any two quantities which are conserved in any Nuclear reaction.

atomic number and mass number are conserved.

18. Which among the following U -238 , U-235 , Pu – 239 , U -233 undergo nuclear fission?

U-235 , Pu – 239 , U -233

19. In which of the reaction, nuclear fission or nuclear fusion energy released per unit mass is greater?

nuclear fusion .

20. Identify isotones among the following: $_2He^4$, $_2He^3$, $_6C^{14}$, $_7N^{14}$, $_8O^{15}$, $_8O^{16}$

$_6C^{14}$, $_8O^{16}$

21. What is the ratio of nuclear densities of two nuclei A and B having mass numbers in the ratio 1:3?

1: 1, Nuclear density is independent of mass number of the nuclei.

22. The ground state energy of electron in hydrogen atom is -13.6eV.Calculate the kinetic and potential energy of electron in this state .

$E_K = -E = 13.6eV$, $E_p = 2E = -27.2eV$

23. Define K factor or multiplication factor in nuclear fission reaction. What is its importance?

It is the ratio of number of neutrons producing fission in a generation to the number of neutrons producing fission in previous generation.

If K> 1 ,the reaction is super critical as in atom bomb . If K = 1, the reaction is critical, as in a nuclear reactor. If K< 1 the reaction is sub critical and the chain reaction may stop.

24. Mention uses of radio isotopes.

Co-60 –used in the treatment of cancer, I -131 -- used in the treatment of thyroid gland, Na-24 – used to study about the functioning of heart, blockage in blood vessels, C-14- radio carbon dating ,to determine the age of fossils.

25. Which of the following radiations α ,β,ϒ i) are similar to X-rays not defelected by electric and magnetic fields ii) are easily absorbed by matter and has greatest ionizing power iii) similar to cathode rays , have medium penetrating and ionizing power.

i) ϒ rays ii) α rays iii) βrays

9. Solids & Semiconductor(Electronic)devices

1 .Which of the following Boron or Aluminium will be preferred for doping a Silicon crystal tomake it extrinsic semiconductor? Name the type of semiconductor thus obtained.

Aluminium, as its size is comparable with silicon atom. P – type semiconductor as Al is trivalent impurity.

2. What is the similarity between zener diode and photodiode. Mention one use for each of them.

Both work under reverse bias. Zener diode is used as a voltage regulator. Photo diode can be used in burglar alarms, Fire alarms, Automatic opening and closing of doors at the shopping malls.

3. Name two factors on which electrical conductivity of a pure semiconductor at a given temperature depends.

i) the width of forbidden band or energy gap ii) intrinsic charge concentration

4. Why base of a transistor must be thin and lightly doped?

So as to have least number of majority carriers recombining at base. This will increase the collector current.

5.What is the ratio of n_e to n_h in i) intrinsic ii) P- type iii) N – type semiconductors?

i) $n_e / n_h = 1$ ii) $n_e / n_h < 1$ iii) $n_e / n_h > 1$

6.What is the phase difference between output and input in a transistor amplifier? What type of feedback is used in a transistor oscillator?

180°, Positive feedback.

7. Name the logic gate(s) obtained by using i) diodes ii) transistor.

i) OR gate , AND gate ii) NOT gate.

8. What are Universal Logic Gates? Why are they called so?

NAND and NOR gates .Because all the other basic gates like OR gate , AND gate and NOT gate can be made from NAND and NOR gates.

9. Mention advantages of LEDs over incandescent lamps.

i) Low operational voltage ii) long life iii) No warm up time is needed, so fast action.

10. Explain why elemental semi conductors cannot be used to make LED's emitting visible light?

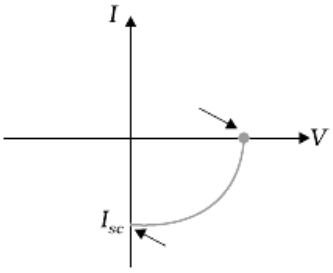
Band gap of elemental semi conductors is in the infra red region therefore they cannot emit visible light.

11. In CE transistor amplifier there is a current and voltage gain associated with the circuit .Therefore there is a Power gain. In other words can we infer that there is a violation of law of conservation of energy ?

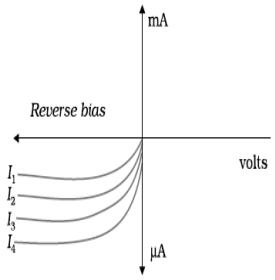
No. Extra power of amplified output is obtained from the DC voltage source.

12. Name the type of diode whose characteristics are shown in the following figures. Mention their uses.

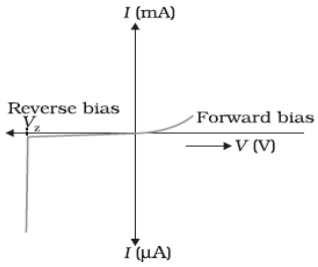
In figure (i) Name the terms the points along X and Y axes which are indicated by the two slanting arrows .



(i)



(ii)



(iii)

i) solar cell , used to power watches calculator, to make solar panel . point on X-axis pointed by the arrow gives open circuit voltage , point on Y-axis pointed by the arrow gives short circuit current

ii) Photo diode used to detect optical signals iii) zener diode used to regulate voltage

13. Three photo diodes D1,D2 and D3 are made up of semi condoctors having band gaps of 2.5eV ,2 eV and 3eV Respectively .Which of them will be able to detect light of wavelength 6000A◦?

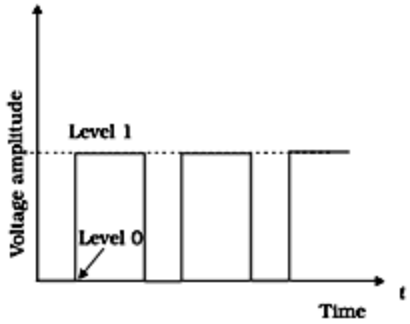
Energy of incident photon is E = $\frac{hC}{\lambda}$ = $\frac{6.6\ \text{x}10-34\ \text{Js}\ \text{x}\ 3\ \text{x}108\ \text{m/s}}{6\times\ 10-7\times\ 1.6\times10-19}$ = 2.06 eV

For the detection of optical signal the energy of incident radiation must be greater than the band gap

It is true only for D2 .Only D2 can detect the radiation.

14. Identify the type of signals from the figures given below

(i)



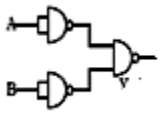
(ii)

i) analog signal ii) digital signal

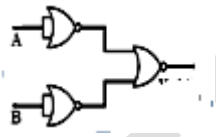
15. Mention the uses of logic gates

Logic gates are used in calculators, digital watches, computers, robots, industrial control systems, and in telecommunications

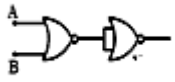
16 Identify the resultant Logic gates from the figures .



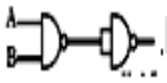
(i)



(ii)



(iii)



(iv)

i) OR ii) AND iii) OR iii) AND