1. The unit Parsec is a measure of

(1) Distance between planets (2) Distance between sun and earth
(3) Brightness of light (4) None of the above.

Ans (2)

Note: **Parsec**, unit for expressing distances to stars and galaxies, used by professional astronomers. It represents the distance at which the radius of Earth's orbit subtends an angle of one second of arc. Thus, a star at a distance of one parsec would have a parallax of one second, and the distance of an object in parsecs is the reciprocal of its parallax in seconds of arc. It approximately equals to 3.26 light-years or 206,000 astronomical units, i.e., 30.9 trillion kilometres.

2. The property of material which enables it to be drawn into wires is called?

(1) Ductility (2) Plasticity (3) Malleability (4) Toughness.

Ans (1)

3. Due to rusting, the mass of a ferrous object

(1) Remains the same (2) increases (3) decreases (4) None.

Ans (2)

Note: The **mass of iron** increases as **rusting** happens when oxygen combines with iron therefore the **mass** increases. when iron is **rusted**, it's **weight** increases, viz.,Iron(Fe) is oxidised to Fe2O3, i.e., **ferric** oxide , which is generally known as **rust**.

4. The presence of sulphur in a hydrocarbon fuels like petro, diesel and coal releases … gas during combustion

(1) SOx (2)NOx (3) CO2 (4) None

Ans (1)

5. Which is the hardest natural material?

(1) Diamond (2). Iron (3) Graphite (4) Steel

Ans (1)

6. Which is the softest material in Mho's hardness scale?

(1) Diamond (2). Iron (3) Graphite (4)Talc

Ans (4)

Note: Reason for Talcum powder using as face powder.

7. Quicksilver is a popular name for

(1) Silver (2) Mercury (3) Stainless Steel (4) Platinum

Ans (2)

8. A 'lead' pencil is a misnomer because it actually contains

(1) Coal tar (2) carbon (3) graphite (4) clay

Ans (3)

9. The ability of an organism to replace it structure or organs is called

(1) Replacement (2) regeneration
(3) Rejuvenation (4) replenishment

Ans (2)

10. A Hydrometer is used to measure:

(1) Relative Humidity (2) Viscosity
(3) Buoyancy (4) Specific Gravity of Liquid

Ans (4)

11. Process of aluminium oxide coating on aluminum object is

(1) Oxidizing (2) Anodizing
(3) Galvanizing (4) None of these

Ans (2)

12. Bagasse is

(1) Type of coal (2) Type of wood fuel
(3) Rice straw (4) Fiber portion of sugarcane after extracting the juice

Ans (4)

13. Heat flews through solids only by

(1) Conduction (2) convection
(1) Radiation (4) a combination of these

Ans (1)

14. Air resistance of car at 20 KMPH speed is R. The air resistance at 40 KMPH will be:

(1) R (2) 2R (3) R^2 (4) 4R

Ans (4)

Note: $R \propto V^2$. $V \rightarrow 2V \therefore R \rightarrow 4R$

15. The unit of kinematic viscosity is

(1) m kg/sec (2) kg sec/m^2
(3) m^2/s (4) none of these

Ans (3)

Note: Kinematic viscosity is the ratio of the viscous force to the inertial force or fluid density $\boldsymbol{\rho}$:
Kinematic viscosity has SI units of $m^2 s^{-1}$. The physical unit for kinematic viscosity is the *stokes* (St). It is sometimes expressed in terms of ***centistokes*** (cS or cSt); 1 stokes = 100 centistokes = 1 $cm^2 s^{-1}$ = 0.0001 $m^2 s^{-1}$.

16. A Barometer is used to measure:

(1) Pressure in a pipe line (2) Very low pressures
(3) Atmospheric pressure (4)none of these

Ans (3)

17. A ball is thrown vertically upwards with a velocity of 980 cm/s. The time for the ball to come back to earth will be:

(1) 20 sec (2) 10 sec (3) 40 sec (4) 50 sec

Ans (1)

18. For a simple pendulum the time period of one oscillation, T is given by:

(1) $2\pi\sqrt{\frac{g}{l}}$ (2) $2\pi\sqrt{\frac{2l}{g}}$

(3) $2\pi\sqrt{\frac{l}{2g}}$ (4) $2\pi\sqrt{\frac{l}{g}}$

Ans (4)

19. For a simple pendulum the frequency of oscillation, f is given by:

(1) $\frac{1}{2\pi}\sqrt{\frac{g}{l}}$ (2) $\frac{1}{2\pi}\sqrt{\frac{2l}{g}}$

(3) $\frac{1}{2\pi}\sqrt{\frac{l}{2g}}$ (4) $\frac{1}{2\pi}\sqrt{\frac{l}{g}}$

Ans (1)

20. In isothermal expansion of gases

(1) Temperature is lowered (2) Temperature increases
(3) Temperature is unaltered (4) Temperature drops to zero

Ans (1)

21. In a 4 stroke Diesel engine, RPM of the crank shaft is 1000 RPM, the cam shaft RPM is

(a) 1000 (b) 500 (c) 1500 (d) 2000

Ans: (b)

22. Choose the wrong statement

1.	Lapping	-	Valve seat
2.	Connecting rod small end bearing	-	Needle bearing
3.	Valve levers	-	Tappet clearance
4.	Cylinders	-	Honing

Ans: (b)

Note: Connecting rod bearing use - Shell bearing

23. Firing order of a 4 cylinder - 4 stroke engine is

(a) 1,3,4,2 (b) 1,2,4,3 (c) 1,2,3,4 (d) 1,3,2,4

Ans: (a)

Note: Most **4-cylinder engines** have a **firing order** of 1-3-**4**-2 although other **firing orders** such as 1-3-2-**4**, 1-**4**-3-2 or 1-2-**4**-3 is possible.

24. The functions of flywheel and governor are respectively**(answer option not given)**

(a) To increase power, to reduce speed
(b) To balance the engine, to save fuel.
(c) To even out the power output, to maintain constant speed at a particular load.
(d) To decrease the power, to increases the speed.

Ans: (c)

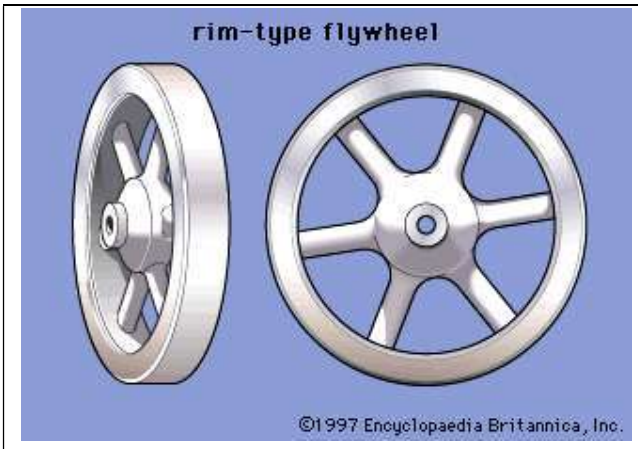
Note: **Governor is a** device that automatically maintains the rotary speed of an engine or other prime mover within reasonably close limits regardless of the load. A typical governor regulates an engine's speed by varying the rate at which fuel is furnished to it. Nearly all governors depend for their action on centrifugal force and consist of a pair of masses rotating about a spindle driven by the prime mover and kept from flying outward by a controlling force, usually applied by springs. With an increase in speed, the controlling force is overcome and the masses move outward; the movement of the masses is transmitted to valves supplying the prime mover with its working fluid or fuel. The revolving masses are balls attached to a vertical spindle by link arms, and the controlling force consists of the weight of the balls. If the load on the engine decreases, the speed will increase, the balls ***M*** will move out, and the member ***C*** will slide up the vertical spindle and reduce the steam admitted to the engine, thus reducing the speed. An increase in the load will have the opposite effect. Modern governors are used to regulate the flow of gasoline to internal-combustion engines and the flow of steam, water, or gas to various types of turbines.

https://www.britannica.com/technology/governor-machine-component
https://www.britannica.com/technology/flywheel

Flywheel: Flywheel is an internal energy storage device. It absorbs mechanical energy during the period when the supply of energy is more than the requirement and releases it during the period when the requirement of energy is more than the supply. The main function of a fly wheel is to smoothen out variations in the speed of a shaft caused by torque fluctuations.

In automobile engines the flywheel serves to smooth out the pulses of energy provided by the combustion in the cylinders and to provide energy for the compression stroke of the pistons.

The energy stored in a flywheel, however, depends on both the weight distribution and the rotary speed; if the speed is doubled, the kinetic energy is quadrupled. A rim-type flywheel will burst at a much lower rotary speed than a disk-type wheel of the same weight and diameter. For minimum weight and high energy-storing capacity, a flywheel may be made of high-strength steel and designed as a tapered disk, thick at the centre and thin at the rim (***see*** Figure B).



(A) rim-type flywheel; (B) tapered-disk flywheel

Encyclopædia Britannica, Inc.

In power presses the actual punching, shearing, and forming are done in only a fraction of the operating cycle. During the longer, nonactive period, the speed of the flywheel is built up slowly by a comparatively low-powered motor. When the press is operating, most of the required energy is provided by the flywheel.

25. Otto cycle consists of…processes

(1) Two isentropic and two constant volumes

(2) Two isentropic and two constant pressures

(3)Two adiabatic and two isothermal

(4)Two isothermal and two constant pressures

Ans (1)

Box 1

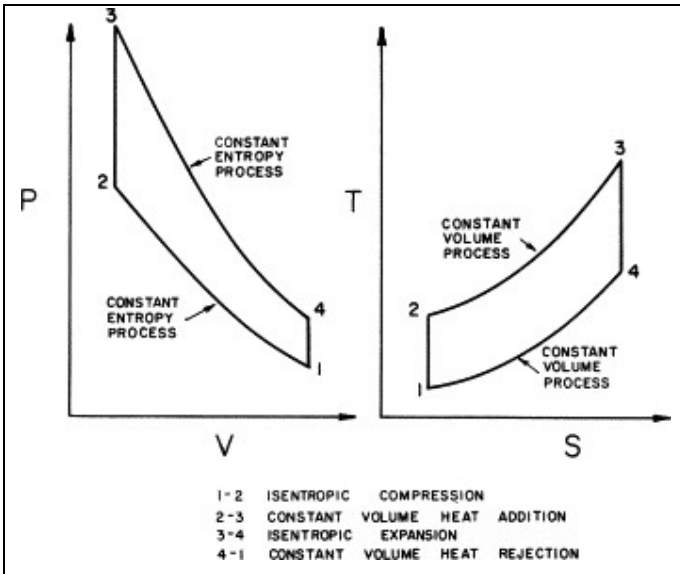
The four-stroke **Otto cycle** is made up of the following four internally reversible **processes**:

1–2, isentropic compression;

2–3, constant-volume heat addition;

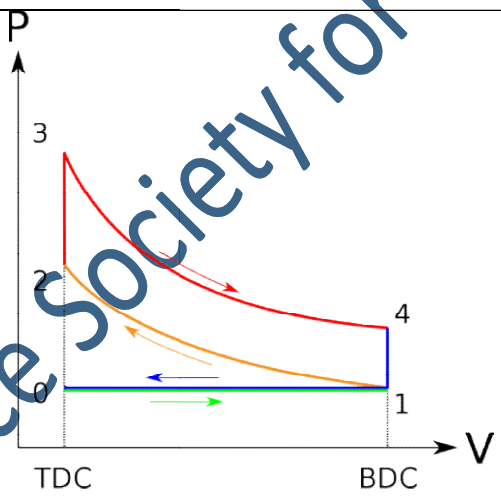
3–4, isentropic expansion; and

4–1, constant-volume heat rejection.



INTERNAL COMBUSTION ENGINES, CHARLES L. PROCTOR II, IN ENCYCLOPEDIA OF PHYSICAL SCIENCE AND TECHNOLOGY (THIRD EDITION), 2003

Box 2



The pressure-volume diagram of an ideal Otto Cycle process. It consists of two isochoric two adiabatic and two isobaric processes

https://en.wikipedia.org/wiki/Otto_cycle#/media/File:P-V_Otto_cycle.svg

26. Diesel cycle consists of…processes

(1) Two isentropic and two constant volumes

(2) Two isentropics and one constant volume and one constant pressure heat addition

(3)Two adiabatic and two isothermal
(4)Two isothermal and two constant pressures

Ans (2)

Box: Diesel cyle illustration

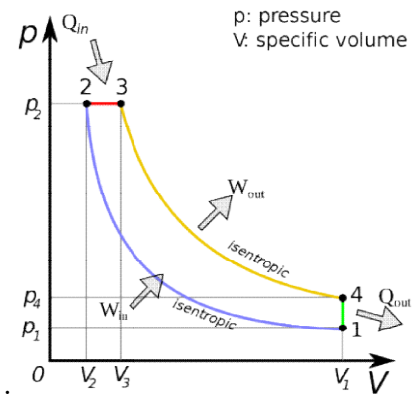


Fig: p-V Diagram for the ideal **Diesel cycle**. The cycle follows the numbers 1-4 in clockwise direction.
https://en.wikipedia.org/wiki/Diesel_cycle#/media/File:DieselCycle_PV.svg

Box: Diesel cycle brief

The Diesel cycle is a compression ignition (rather than spark ignition) engine. Fuel is sprayed into the cylinder atP_2 (high pressure) when the compression is complete, and there is ignition without a spark. An idealized Diesel engine cycle is shown in Figure ...

This cycle can operate with a higher compression ratio than the Otto cycle because only air is compressed and there is no risk of auto-ignition of the fuel. Although for a given compression ratio the Otto cycle has higher efficiency, because the Diesel engine can be operated to higher compression ratio, the engine can actually have higher efficiency than an Otto cycle when both are operated at compression ratios that might be achieved in practice.

https://www.britannica.com/technology/diesel-engine

27. The planet farthest from the Sun is

(1) Neptune (2) Pluto

(3) Saturn (4) Uranus

Ans (1)

Note: Now Pluto is not treated as a planet.

28. Sea breeze and land breeze are due to heating of atmosphere by

(1) conduction (2) convection
(3) radiation (4) None

Ans (2)

29. The universal Law of Gravitation was propounded by:

(1) Galileo (2) John Kepler
(3) Issac Newton (4) Copernicus

Ans (3)

30. Among the following, sound travels at minimum speed in:

(1) Atmospheric air (2) inert gases
(3) Aluminium (4) steel

Ans (1)

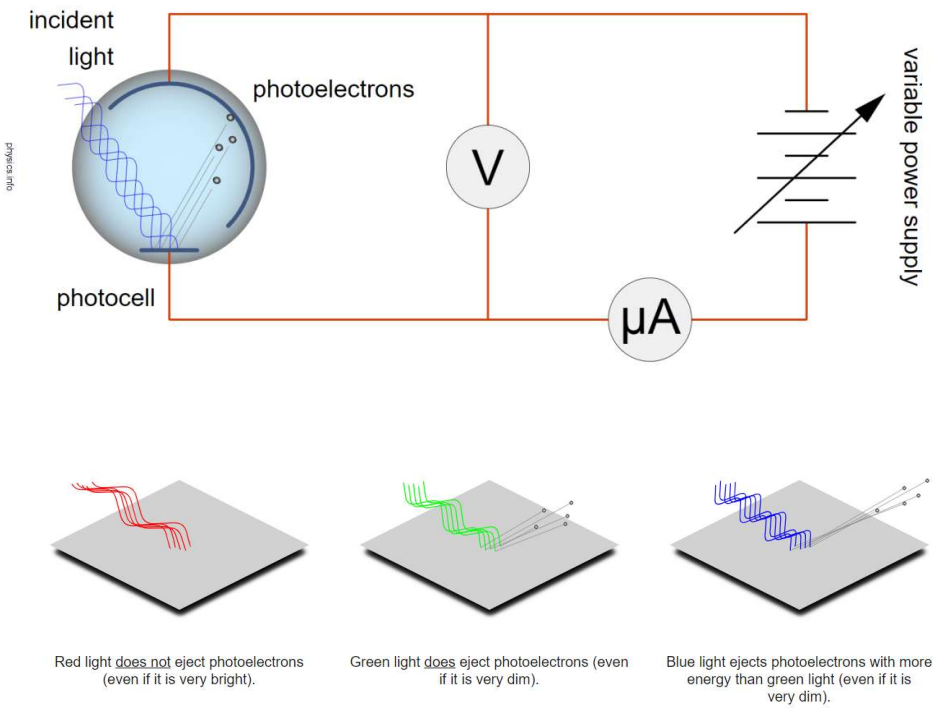
31. Photoelectric effect was proved by whom and also got Noble prize for that is

(1) Galileo (2) John Kepler
(3) Newton (4) Albert Einstein

Ans (4)

Note: Photoelectric effect, phenomenon in which electrically charged particles are released from or within a material when it absorbs electromagnetic radiation. The effect is often defined as the ejection of electrons from a metal plate when light falls on it. In a broader definition, the radiant energy may be infrared, visible, or ultraviolet light, X-rays, or gamma rays; the material may be a solid, liquid, or gas; and the released particles may be ions (electrically charged atoms or molecules) as well as electrons. The phenomenon was fundamentally

significant in the development of modern physics because of the puzzling questions it raised about the nature of light—particle versus wavelike behaviour—that were finally resolved by Albert Einstein in 1905.
https://www.britannica.com/science/photoelectric-effect. Accessed 29 January 2021.



The Physics Hypertextbook
©1998–2021 Glenn Elert
Author, Illustrator, Webmaster
https://physics.info/photoelectric/

32. Litmus is obtained from:

(1)an alga
(2) a bacterium
(3)A fungus
(4) lichen

Ans (4)

Note: **Litmus** is a water-soluble mixture of different dyes extracted from lichens. It is often adsorbed onto filter paper to produce one of the oldest forms of pH indicator, used to test materials for acidity.

33. The three primary colours are:

(1) Red, blue, green
(2) blue, yellow and red
(3)Yellow, orange and red
(4) violet, indigo and blue

Ans (1)

34. Law of Motion involved in recoil of a gun is:

(1)Newton's 1st law of motion
(2) Newton's 2nd law of motion
(3)Newton's 3rd law of motion
(4) none of the above

Ans (3)

35. Among the following, sound travels at maximum speed in:

(1)Vacuum
(2) air
(3)Liquid
(4) Steel

Ans (4)

NOTE: SPEED OF SOUND IN DIFFERENT MEDIA

Medium (20 °C)	Speed of Sound Waves (m/s)
Dry Air	343
Water	1437
Wood	3850
Glass	4540
Aluminum	6320

https://www.ck12.org/physics/speed-of-sound/lesson/Speed-of-Sound-MS-PS/

- The speed of sound is the distance that sound waves travel in a given amount of time. The speed of sound in dry air at 20 °C is 343 meters per second.
- Generally, sound waves travel most quickly through solids, followed by liquids, and then by gases.

- For a given medium, sound waves travel more slowly at lower temperatures.

36. The three secondary colours are:

(1) Red, blue, green
(2) blue, yellow and red
(3)Yellow, orange and red
(4) Orange, Green, Violet.

Ans (4)

Note: There are a variety of sets of primary colors. The most common set of primary colors is red (R), green (G) and blue (B). When red, green and blue light are mixed or added together with the proper intensity, white (W) light is obtained. This is often represented by the equation below:

R + G + B = W

Yellow (Y), magenta (M) and cyan (C) are sometimes referred to as **secondary colors of light** since they can be produced by the addition of equal intensities of two primary colors of light. The addition of these three primary colors of light with varying degrees of intensity will result in the countless other colors that we are familiar (or unfamiliar) with.

https://www.physicsclassroom.com/class/light/Lesson-2/Color-Addition#:~:text=Yellow%20(Y)%2C%20magenta%20(,two%20primary%20colors%20of%20light.

For the human eye, good primary colors of light are red, green, and blue. Combining lights of these colors produces a large range of visible colors.

Color Basics

Three Primary **Colors** (Ps): Red, Yellow, Blue.
Three Secondary Colors (S'): Orange, Green, Violet.
Six Tertiary **Colors** (Ts): Red-Orange, Yellow-Orange, Yellow-Green, Blue-Green, Blue-Violet, Red-Violet, which are formed by mixing a primary with a **secondary**.
https://www.usability.gov/how-to-and-tools/methods/color-basics.html

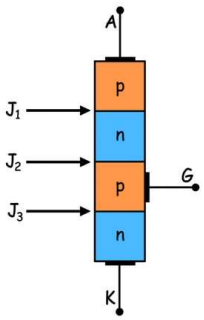
37. Thyristers are basically

(1)SCRs
(2) Triacs
(3) Both SCRs and Triacs
(4) All PNPN devices

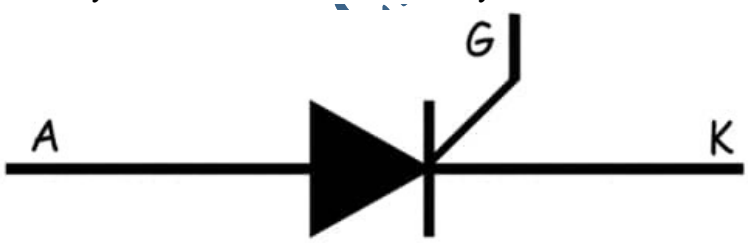
Ans (1)

Note: The **thyristor** is also called a silicon-controlled rectifier (**SCR**) is **basically** a four-layer three-junction pnpn device. It has three terminals: anode, cathode, and gate. It is **basically** an electronic switching device which can remain in conducting (on) and nonconductin. **Silicon Controlled Rectifier** (**SCR**) is a unidirectional semiconductor device made of silicon. This device is the solid state equivalent of thyratron and hence it is also referred to as **thyristor** or **thyroid transistor**. In fact, SCR (Silicon Controlled Rectifier) is a trade name given to the thyristor by General Electric Company. Basically, **SCR** is a three-terminal, four-layer semiconductor device consisting of alternate layers of p-type and n-type material.Hence it has three pn junctions J_1, J_2 and J_3. The figure below shows an SCR with the layers p-n-p-n. The device has terminals Anode(A), Cathode(K) and the Gate(G). The Gate terminal(G) is attached to the p-layer nearer to the Cathode(K) terminal.

https://www.electrical4u.com/thyristor-silicon-controlled-rectifier-scr/



The symbol of SCR or Thyristor is shown in the figure below.



https://www.electricalexams.co/power-electronics-mcq/#:~:text=The%20thyristor%20is%20also%20called,state.

38. Electricity conduction/production in semi conductors are due to

(1)Holes and electrons
(2) protons and electrons
(1) protons and neutrons
(4) neutrons and electrons

Ans (1)

39. What is solar cell?

Note: Solar cell is a key device that converts the light energy into the electrical energy in photovoltaic energy conversion. In most cases, semiconductor is used for solar cell material. The energy conversion consists of absorption of light (photon) energy producing electron–hole pairs in a semiconductor and charge carrier separation.

40. Jet engine working principle is

(1) Newton's 1st law of motion
(2) Newton's 2nd law of motion
(3) Newton's 3rd law of motion
(4) none of the above

Ans (3)

41. Rowing of boat is as per

(1) Newton's 1st law of motion
(2) Newton's 2nd law of motion
(3)Newton's 3rd law of motion
(4) none of the above

Ans (3)

42. Which of the following devices converts electrical energy into mechanical energy ?

(1)Dynamo
(2) Transformer
(3)Electric motor
(4) Inductor

Ans (3)

43. What is the source of electric energy in an artificial satellite?

(1) a mini nuclear reactor
(2) a dynamo
(3) a thermopile
(4) Solar cells

Ans (4)

44. The advantage of A. C. over D. C. is that:

(1)It contains more electrical energy
(2)It is free from voltage fluctuations
(3)Its generation costs much less
(4)It can be transmitted over long distances with minimum power loss

Ans (4)

Note: Alternating current (AC) is the type of electric current generated by the vast majority of power plants (thermal, gas turbine, hydro, geothermal, etc) and used by most power distribution systems. Alternating current is cheaper to generate and has fewer energy losses than direct current when transmitting electricity over long distances. Another major advantage of alternating current is that its voltage can be modified relatively easily using a transformer, which allows power to be transmitted at very high voltages before being stepped down to safer voltages for commercial and residential use.this minimizes energy losses.

45. During combustion process, the stored chemical energy in the diesel is converted into

(1)mechanical energy (2) thermal/heat energy due to combustion of fuel
(3)electrical energy `(4) hydraulic energy

Ans (2)

46.. Admittance is the reciprocal of :

(1)Reactance (2) impedance
(3)Susceptance (4) inductance

Ans (2)

Electrical impedance, measure of the total opposition that a circuit or a part of a circuit presents to electric current. Impedance includes both resistance and reactance (***qq.v.***). The resistance component arises from collisions of the current-carrying charged particles with the internal structure of the conductor. The reactance component is an additional opposition to the movement of electric charge that arises from the changing magnetic and electric fields in circuits carrying alternating current. Impedance reduces to resistance in circuits carrying steady direct current.

The magnitude of the impedance ***Z*** of a circuit is equal to the maximum value of the potential difference, or voltage, ***V*** (volts) across the circuit, divided by the maximum value of the current ***I*** (amperes) through the circuit, or simply ***Z*** = ***V***/***I.*** The unit of impedance, like that of resistance, is the ohm. Depending on the nature of the reactance component of the impedance (whether predominantly inductive or capacitive), the alternating current either lags or leads the voltage. The reciprocal of the impedance, 1/***Z,*** is called the admittance and is expressed in terms of the unit of conductance, the mho unit (ohm spelled backward).

Britannica, The Editors of Encyclopaedia. "Electrical impedance". *Encyclopedia Britannica*,

27 Jun. 2008, https://www.britannica.com/science/electrical-impedance. Accessed 21 September 2021.

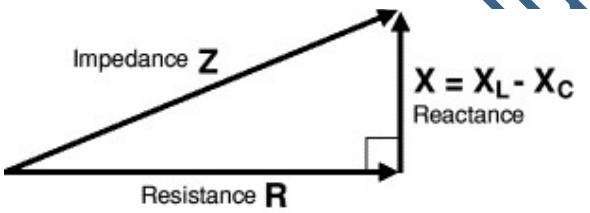
Note:

IMPEDANCE

Impedance: the effective resistance of an electric circuit or component to alternating current, arising from the combined effects of ohmic resistance and reactance.

Impedance (symbol Z) is a measure of the overall opposition of a circuit to current. It is like resistance, but it also takes into account the effects of capacitance and inductance. Impedance is measured in ohms (Ω).Because the effects of capacitance and inductance vary with the frequency of the current passing through the circuit, and this means **impedance varies with frequency**. The effect of resistance is constant regardless of frequency.

Therefore four electrical quantities determine the impedance (Z) of a circuit: resistance (R), capacitance (C), inductance (L) and frequency (f).



$$\text{Impedance, } Z = \sqrt{R^2 + X^2}$$

Impedance

$$\text{Impedance, } Z = \frac{V}{I}$$

$$\text{Resistance, } R = \frac{V}{I}$$

V	=	voltage	in	volts	(V)
I	=	current	in	amps	(A)
Z	=	impedance	in	ohms	(Ω)

R = resistance in ohms (Ω)

IMPEDANCE CAN BE SPLIT INTO TWO PARTS:

1. Resistance R (the part which is constant regardless of frequency)

2. Reactance X (the part which varies with frequency due to capacitance and inductance). https://electronicsclub.info/impedance.htm

47. The most essential instrument required by a TV technician is :

(1)Voltmeter
(2) Megger
(3) Ohm meter
(4) Avo meter

Ans (4)

48. Carbon brushes are used in electric motors to:
(1) Brush off carbon deposits on the commutator
(2) Provide a path for flow of current
(3) Prevent overheating of armature windings
(4) Prevent sparking during commutation

Ans ()

NOTE: A CARBON BRUSH IS A COMPONENT USED TO CONDUCT ELECTRICAL CURRENT BETWEEN THE STATIONARY AND ROTATING PARTS OF A MOTOR. IN A GENERATOR OR MOTOR, THE COMMUTATOR ROTATES ON A SHAFT AND THE FIXED CARBON BRUSH RIDES ON IT TO PERMIT THE FLOW OF ELECTRICITY AND COMPLETE A CIRCUIT.

A carbon brush is a sliding contact used to transmit electrical current from a static to a rotating part in a motor or generator, and, as regards DC machines, ensuring a spark-free commutation.A brush is a device which conducts current between stationary wires and moving parts, most commonly in a rotating shaft.Typical applications include electricmotors, alternators and electric generators.

1.Brushes are used to conduct current in the electric generator, be it either AC generator or DC generator.

HTTPS://EXPANDUSCERAMICS.COM/QA/WHAT-IS-THE-USE-OF-BRUSHES-IN-AC-GENERATOR.HTML

HOW DO CARBON BRUSHES WORK?

A spring pushes on the carbon brush allowing the brush to make continuous contact with the commutator bars or slip rings depending on the type of motor. The copper wires from the brushes are connected to the power supply.

49. In an RLC series circuit, during resonance, the impedance will be :

(1) Zero
(2) Minimum
(3)Maximum
(4) None of these

Ans (2). Eq..

Note: At resonance, the total impedance of series RLC circuit is equal to resistance i.e., Z = R, impedance has only real part but no imaginary part and this impedance at resonant frequency is called dynamic impedance and this dynamic impedance is always less than impedance of series RLC circuit.

50. An inductor stores energy in

(1)Electrostatic field
(2) electromagnetic field
(3)Magnetic field
(4) core

Ans (3)