

# Useful Scientific Definitions

## VECTORS

1. A **SCALAR** is a physical quantity that has magnitude (size) only.
2. A **VECTOR** is a physical quantity that has magnitude and direction.
3. **DISPLACEMENT** is the change in position.
4. **SPEED** is the rate of change of distance with time.
5. **VELOCITY** is the rate of change of position with time.
6. **ACCELERATION** is the rate of change of velocity with time.
7. When two or more forces act concurrently at a point, **THE RESULT FORCE** is that single force, applied at the same point, that would produce the same effect.
8. When two or more forces act concurrently at a point, the **EQUILIBRANT** is that single force, applied at the same point, that produces equilibrium.
9. **TRIANGLE LAW OF EQUILIBRIUM:** If three concurrent forces are in equilibrium, the vectors representing these forces, taken in order, form a closed triangle.

### Newsflash:

A body is said to be moving with constant velocity if it covers equal displacements in equal time intervals, no matter how short the latter.

## NEWTON'S LAWS

10. **INERTIA** is the resistance of an object to changing its velocity.
11. **NEWTON'S FIRST LAW:** THE LAW OF INERTIA – if an object is at rest or is moving with constant velocity, it will continue in this state unless acted upon by some resultant external force.
12. **NEWTON'S SECOND LAW:** When a resultant force acts on a body, it will accelerate in the direction of the resultant force with an acceleration which is directly proportional to the resultant force and inversely proportional to the mass of the body.
13. **NEWTON'S THIRD LAW:** If body A exerts a force on body B then body B exerts a force on body A which is equal in magnitude but opposite in direction.

## GRAVITATION

14. **MASS** is the quotient of the resultant force acting on a body and the acceleration produced in that direction.
15. **NEWTON'S LAW OF UNIVERSAL GRAVITATION:** Every particle attracts every other particle in the universe with a force that is directly proportional to the product of their masses and inversely proportional to the square of their distance apart.

## WORK AND ENERGY

16. **GRAVITATIONAL POTENTIAL ENERGY** is the stored up energy by virtue of the position of the mass of the object in the gravitational field.
17. **KINETIC ENERGY** is the energy by virtue of the motion of the mass of a body.
18. **WORK DONE** is the product of the force acting and the displacement in the direction of the force.

19. **LAW OF CONSERVATION OF ENERGY:** The total energy of a closed system remains constant as we cannot create or destroy energy.
20. A **JOULE** is the amount of work done when a force of 1N moves its point of application one metre in the direction of the force.
21. **ENERGY** is the ability to do work.
22. **POWER** is the rate of doing work or the rate at which energy is transferred
23. A **WATT** is the rate of working or energy transfer of one joule per second.

## MOMENTUM

24. **MOMENTUM** is the product of mass and velocity.
25. **NEWTON'S SECOND LAW:** The rate of change of momentum of a body is directly proportional to the resultant force acting on it, and is in the direction of the resultant force.
26. **FORCE** is the rate of change of momentum with time.
27. **IMPULSE** is the product of force and time.
28. **LAW OF CONSERVATION OF MOMENTUM:** The total linear momentum of a closed system of moving bodies interacting only with each other, remains constant in any direction.

## ELECTROSTATICS

29. **THE LAW ON CONSERVATION OF CHARGE:** In a closed system the sum of positive and negative charges is zero.
30. **COULOMB'S LAW:** Two stationary charged particles exert a force of attraction or repulsion on each other which is directly proportional to the product of the charges and inversely proportional to the square of their distance apart.
31. An **ELECTRIC FIELD** is a region in space in which a stationary charged object experiences an attractive or a repulsive force. (This distinguishes it from a magnetic field which exerts forces on moving charges).
32. The **ELECTRIC FIELD INTENSITY** at a point in the electric field is the quotient of the force acting on a positive test charge at that point and the magnitude of the charge.
33. The **POTENTIAL DIFFERENCE** between two points A and B in an electric field is the quotient of the work done in moving a positive test charge from one point to the other and the magnitude of the test charge.

## CURRENT ELECTRICITY

34. An **AMPERE** is the current strength when one coulomb of charge passes a point in the circuit in one second.
35. A **COULOMB** is the quantity of charge which passes a point in a conductor in one second when carrying a current of one ampere.
36. **THE P. D.** between two points A and B in an electric field is the work done per unit positive test charge moved between the two points.
37. **E.M.F.** is the amount of energy supplied per unit of charge passing through the cell or e.m.f. is the power per unit current passing through the cell.
38. **OHM'S LAW:** At **CONSTANT TEMPERATURE** the **P. D.**

across a resistor is **DIRECTLY PROPORTIONAL** to the **CURRENT** in the resistor.

39. The **RESISTANCE** of a conductor is the **QUOTIENT** of the **R.D.** across its ends **AND THE CURRENT** in the resistor.
40. **ELECTRICAL ENERGY** is the ability to do work in an electrical circuit.
41. The **AMPERE** is that constant current which, if maintained in two infinitely long parallel conductors that are 1 metre apart in a vacuum, will produce between them a force of  $2 \times 10^{-7}$  N per metre of their length.

## BONDING/LIQUIDS

42. **ALLOTROPES** are due to the same element having different physical structures.
43. **LONDON FORCES** are forces of attraction between fluctuating dipoles in atoms and molecules that are close.
44. **COVALENT BONDING** is the attraction between two atoms that share electrons.
45. **SATURATED VAPOUR PRESSURE** is the pressure due to the maximum number of vapour particles that can evaporate at a certain temperature, in a closed system.
46. The **BOILING POINT** is the temperature at which the vapour pressure of a liquid, in an open container, equals the atmospheric pressure on the surface of the liquid.
47. **SURFACE TENSION** of a liquid behaves as if it is stretched sideways and thus has a "skin" or membrane.

## GASES

48. **AN IDEAL GAS** obeys Boyle's law under all conditions.
49. **AVOGADRO'S LAW:** Equal volumes of gasses measured under the same conditions of temperature and pressure, contain equal numbers of molecules.
50. **BOYLE'S LAW** states that at constant temperature the volume of a fixed mass of dry gas is inversely proportional to the pressure exerted on it.

## SOLUBILITY

51. **A MOLE** is the number of anything equal to Avogadro's constant (or, number =  $6,02 \times 10^{23}$ ).
52. A **STANDARD SOLUTION** is one of precisely known concentration, which remains stable.
53. A **SATURATED SOLUTION** The amount of dissolved solute is in equilibrium with the undissolved solute at a given temperature. (All the open spaces between the solvent molecules are filled).
54. A **PRECIPITATE** is a solid which forms during a reaction in solution.
55. A **CLOSED SYSTEM** is not affected by any outside factors or agencies.
56. **DYNAMIC EQUILIBRIUM** The rate at which the solid dissolves is equal to the rate at which the solution precipitates.
57. **ELECTRONEGATIVITY** is the pull of each of two atoms **ON THE PAIR OF SHARED ELECTRONS** forming the bond between them.

## REDOX

58. The **REDUCTION POTENTIAL** is the ability of a chemical species to be reduced.
59. A **HALF CELL** is an **ELECTRODE** which can conduct electricity and has a chemical in two different oxidation states.

60. **CELL POTENTIAL (E)** is a measure of the potential difference between two half cells.
61. **REDUCTION** is any process in which an oxidation number decreases.
62. A **REDUCING AGENT** is an atom, molecule or ion that causes a decrease in the oxidation state of another substance and is itself oxidized.
63. An **OXIDIZING AGENT** is an atom, molecule or ion that causes an increase in the oxidation state of another substance and is itself reduced.
64. **OXIDATION** is any process in which an oxidation number increases.
65. **REDOX REACTIONS** are chemical reactions in which oxidation and reduction takes place simultaneously.
66. An **ANODE** is the electrode at which oxidation occurs.
67. A **CATHODE** is the electrode at which reduction occurs.
68. **CATIONS** are positively charged ions.
69. **ANIONS** are negatively charged ions.
70. A **GALVANIC (or voltaic) CELL** generates electricity from a spontaneous redox reaction.
71. An **ELECTROLYTIC CELL** uses electrical energy from outside the cell to cause a redox reaction to occur.
72. **ELECTROLYTES** are pure substances or substances in solution that conduct electricity by the movement of ions.
73. **ELECTROLYSIS** is the process of driving a non-spontaneous redox reaction to occur by means of electrical energy.

## REACTION RATES

74. **ACTIVATION ENERGY** is the minimum energy that reactants must have for reaction to occur.
75. An **ACTIVATED COMPLEX** is the short lived combination of reacting atoms, molecules or ions that is intermediate between reactants and products.
76. A **CATALYST** is a substance that increases the rate of a reaction but can be recovered chemically unchanged after the reaction is complete.

## EQUILIBRIUM

77. **CHEMICAL EQUILIBRIUM** exists when the rates of forward and reverse reactions are the same and the amounts of the species present do not change with time.
78. **LE CHATELLER'S PRINCIPLE** states that if a closed system at equilibrium is subjected to a stress, the system will react in a way that tends to relieve the stress.

## ACIDS AND BASES

79. **BONSTED – LOWREY** acids are proton donors and bases are proton acceptors.
80. **AMPHOTERIC** means capable of acting either as an acid or a base.
81. **TITRATION** means to measure the volume of a solution of one reactant that reacts exactly with the measured amount of another reactant.
82. An **INDICATOR** is a compound which changes colour in a specific pH range.
83. The **END POINT** is the point at which an indicator changes colour.
84. **NEUTRALIZATION** is the reaction of an acid with a base.
85. **HYDROLYSIS** means reaction in which the water molecule is split