TNPSC Group IV — General Science

Revision Pack · quick notes + practice MCQs with answer key
Verified content · 100% free · no login · braingrain.in

A. Quick Revision Notes

Physics — mechanics, heat, light, electricity

Newton's laws: inertia; force = mass times acceleration (F = ma); action equals reaction. SI base units: metre, kilogram, second, ampere, kelvin. Work = force times distance; power = work/time (watt); energy in joules — kinetic energy = 1/2 times m times v squared, potential energy = mgh. Acceleration due to gravity g = 9.8 m/s squared. Heat transfers by conduction, convection and radiation; 0 degrees C = 273 K. Light shows reflection and refraction (Snell's law); the visible spectrum is VIBGYOR; light speed is about 3 times 10^8 m/s. Electricity: Ohm's law V = IR; power = VI; energy is billed in kilowatt-hours.

Chemistry — elements, acids & bases, metals

Matter exists as solid, liquid or gas. An atom has protons, neutrons and electrons; the atomic number equals the number of protons. The modern periodic table (Moseley) arranges elements by atomic number into groups and periods; Mendeleev's earlier table used atomic mass. Acids have pH below 7, taste sour and turn blue litmus red (HCl, H2SO4); bases have pH above 7, feel soapy and turn red litmus blue (NaOH); pH 7 is neutral; acid plus base gives salt and water (neutralisation). Metals are lustrous, malleable conductors; alloys include brass (copper + zinc) and steel (iron + carbon).

Biology — cell, human body, plants

The cell is the basic unit of life; Robert Hooke first observed cells in cork (1665). Cells are prokaryotic or eukaryotic. Organelles: nucleus (control centre), mitochondria (the 'powerhouse', makes ATP), chloroplast (photosynthesis, in plants), ribosomes (protein synthesis). Human systems include digestive, respiratory (lungs), circulatory (a four-chambered heart; blood groups A, B, AB, O and Rh), nervous (brain and neurons) and excretory (kidneys). In plants, photosynthesis converts carbon dioxide and water into glucose and oxygen using chlorophyll and sunlight; transpiration is water loss through leaves.

Nutrition, health & diseases

Balanced nutrition needs carbohydrates, proteins, fats, vitamins, minerals and water. Vitamin deficiencies: A causes night blindness, B1 beriberi, C scurvy, D rickets, and B12 anaemia. Diseases are communicable — bacterial (tuberculosis, cholera, typhoid), viral (polio, measles, dengue spread by Aedes mosquito) and protozoan (malaria by the female Anopheles mosquito) — or non-communicable (diabetes, hypertension, heart disease). Immunisation uses vaccines; Edward Jenner developed the smallpox vaccine. Iodised salt prevents goitre. Proteins build and repair tissue; carbohydrates and fats provide energy.

Environment & biodiversity

An ecosystem has biotic and abiotic parts connected through food chains and webs. Biodiversity is the variety of life; India is a megadiverse country with hotspots in the Western Ghats, the Eastern Himalaya, Indo-Burma and Sundaland. Conservation is in-situ — national parks, wildlife sanctuaries, biosphere reserves, Project Tiger (1973) and Project Elephant — and ex-situ, such as zoos and seed banks. The IUCN Red List grades species as endangered, vulnerable and so on. The Wildlife Protection Act 1972 safeguards species. Nutrients recycle through the carbon and nitrogen cycles.

Science & technology developments

ISRO was formed in 1969; Vikram Sarabhai is called the father of India's space programme, and Aryabhata was the first Indian satellite (1975). Homi Bhabha is the father of India's nuclear programme; the first reactor was Apsara and nuclear tests were held at Pokhran in 1974 (Smiling Buddha) and 1998. DRDO develops missiles such as Agni and Prithvi; A.P.J. Abdul Kalam is known as the 'Missile Man'. National research bodies include CSIR, ICAR (agriculture), ICMR (medicine) and C-DAC (PARAM supercomputers). The Green Revolution and IT revolution transformed the economy.

Space & defence technology

ISRO's launch vehicles include the reliable PSLV (the 'workhorse'), the GSLV and the heavy-lift LVM3/GSLV Mk-III. Missions: Chandrayaan-1 (2008) detected water on the Moon; the Mars Orbiter Mission/Mangalyaan (2013) made India the first country to reach Mars orbit on its first attempt; Chandrayaan-3 (2023) soft-landed near the lunar south pole, a world first. Satellite series include INSAT (communication), IRS (remote sensing) and NavIC (regional navigation). Defence systems: DRDO's Agni, Prithvi and BrahMos missiles and the Tejas light combat aircraft.

Everyday applications of science

A pressure cooker cooks faster because higher pressure raises water's boiling point. A thermos flask uses a vacuum to block conduction and convection. LPG cooking gas is mainly butane and propane. A refrigerator cools by evaporation of a refrigerant. Optical fibres carry signals by total internal reflection. Soaps and detergents clean by emulsifying oil and grease. A fuse wire melts to protect circuits from overload. Iodised salt prevents goitre. Baking soda is sodium bicarbonate. Ripening of fruit is hastened by the gas ethylene. A lightning conductor safely earths lightning.

B. Practice MCQs (25)

1. Which gas is produced when an acid reacts with a metal?

(A) Oxygen
(B) Carbon dioxide
(C) Hydrogen
(D) Nitrogen

2. The human heart has how many chambers?

(A) Two
(B) Three
(C) Four
(D) Five

3. Which mirror is used as a rear-view mirror in vehicles?

(A) Plane mirror
(B) Concave mirror
(C) Convex mirror
(D) Parabolic mirror

4. The pH of pure water at 25°C is:

(A) 0
(B) 5
(C) 7
(D) 14

5. Deficiency of Vitamin C causes which disease?

(A) Rickets
(B) Scurvy
(C) Beriberi
(D) Night blindness

6. Which organ in the human body produces insulin?

(A) Liver
(B) Kidney
(C) Pancreas
(D) Spleen

7. Which of the following is a good conductor of electricity?

(A) Rubber
(B) Wood
(C) Silver
(D) Glass

8. Photosynthesis in plants takes place in which cell organelle?

(A) Mitochondria
(B) Ribosome
(C) Chloroplast
(D) Nucleus

9. Which disease is caused by the Plasmodium parasite transmitted by the female Anopheles mosquito?

(A) Dengue
(B) Malaria
(C) Filariasis
(D) Chikungunya

10. The chemical formula of common salt (table salt) is:

(A) NaOH
(B) Na■CO■
(C) NaCl
(D) CaCO■

11. Which vitamin is synthesised by the skin on exposure to sunlight?

(A) Vitamin A
(B) Vitamin B12
(C) Vitamin C
(D) Vitamin D

12. Which of the following is the smallest unit of life?

(A) Atom
(B) Molecule
(C) Cell
(D) Tissue

13. The Ozone layer, which protects Earth from UV radiation, is found in the:

(A) Troposphere
(B) Stratosphere
(C) Mesosphere
(D) Thermosphere

14. Which gas is released during the process of photosynthesis?

(A) Carbon dioxide
(B) Nitrogen
(C) Oxygen
(D) Hydrogen

15. The SI unit of electric current is:

(A) Volt
(B) Watt
(C) Ampere
(D) Ohm

16. Which of the following is a renewable source of energy?

(A) Coal
(B) Petroleum
(C) Natural gas
(D) Solar energy

17. The scientific name of the mango tree is:

(A) Mangifera persica
(B) Mangifera indica
(C) Ficus benghalensis
(D) Carica papaya

18. What is the function of the red blood cells (RBCs) in the human body?

(A) Fighting infections
(B) Blood clotting
(C) Carrying oxygen and carbon dioxide
(D) Producing antibodies

19. Which of the following is an example of a chemical change?

(A) Melting of ice
(B) Dissolving sugar in water
(C) Burning of wood
(D) Cutting of paper

20. Decibel (dB) is the unit for measuring:

(A) Light intensity
(B) Sound intensity/loudness
(C) Electric voltage
(D) Temperature

21. India's Chandrayaan-3 mission achieved which historic milestone in August 2023?

(A) Discovery of water ice in permanently shadowed craters
(B) First Indian astronaut landing on the Moon
(C) First lunar orbit insertion by an Indian spacecraft
(D) Soft landing near the Moon's south pole — making India the first country to do so

22. What is CRISPR-Cas9 technology primarily used for?

(A) Measuring cosmic radiation in deep space
(B) Precise editing of DNA sequences in living organisms
(C) Manufacturing semiconductor chips at nanoscale
(D) Developing quantum computing algorithms

23. India's three-stage nuclear power programme, conceived by Homi Bhabha, is designed to ultimately use which fuel?

(A) Plutonium imported from Russia
(B) Uranium-235 imported from the USA
(C) Thorium-232, which India has in large reserves
(D) Hydrogen fusion from ocean water

24. The 'Paris Agreement' (2015) on climate change set a global temperature goal of:

(A) Limiting warming to well below 2°C, pursuing efforts to limit to 1.5°C
(B) Stabilising temperatures at current 2015 levels
(C) Limiting warming to 1°C above pre-industrial levels
(D) Reducing warming by 2°C from current levels by 2100

25. Which Indian Space Research Organisation mission successfully performed a Gravity Assist manoeuvre around Mars in 2014?

(A) GSAT-30
(B) Aditya-L1
(C) Chandrayaan-2
(D) Mars Orbiter Mission (Mangalyaan)

C. Answer Key & Explanations

1. (C) When an acid reacts with an active metal (such as zinc or iron), hydrogen gas is produced along with a salt. For example: Zn + H■SO■ → ZnSO■ + H■↑

2. (C) The human heart has four chambers: two upper chambers (right atrium and left atrium) and two lower chambers (right ventricle and left ventricle) that pump blood through pulmonary and systemic circulation.

3. (C) Convex mirrors are used as rear-view mirrors in vehicles because they give an erect, diminished image with a wider field of view compared to plane mirrors.

4. (C) Pure water at 25°C has equal concentrations of H■ and OH■ ions (10■■ mol/L each), making its pH exactly 7, which is defined as neutral.

5. (B) Vitamin C (ascorbic acid) deficiency causes scurvy, characterised by bleeding gums, swollen joints, skin haemorrhages, and poor wound healing.
6. (C) Insulin is produced by the beta cells of the Islets of Langerhans in the pancreas. It regulates blood glucose levels by facilitating glucose uptake into cells.
7. (C) Silver is the best conductor of electricity among all metals due to its free electrons that can move easily through the lattice to carry current.
8. (C) Photosynthesis occurs in the chloroplasts of plant cells, which contain chlorophyll — the green pigment that absorbs sunlight to convert CO■ and water into glucose and oxygen.
9. (B) Malaria is caused by Plasmodium species (P. falciparum, P. vivax, etc.) and is transmitted to humans through the bite of infected female Anopheles mosquitoes.
10. (C) Common table salt is sodium chloride (NaCl), an ionic compound formed from the reaction of sodium (Na) and chlorine (Cl). It is used for food flavouring and preservation.
11. (D) Vitamin D (calciferol) is synthesised in the skin when ultraviolet B (UVB) radiation from sunlight converts 7-dehydrocholesterol to Vitamin D3 (cholecalciferol).
12. (C) The cell is the smallest structural and functional unit of life. All living organisms are made of one or more cells that can carry out all basic life processes.
13. (B) The ozone layer is located in the stratosphere, approximately 15–40 km above Earth's surface, where it absorbs most of the Sun's harmful ultraviolet (UV-B and UV-C) radiation.
14. (C) During photosynthesis, plants split water molecules (photolysis) and release oxygen gas (O■) as a by-product. The process: 6CO■ + 6H■O + light → C■H■■O■ + 6O■.
15. (C) The ampere (A) is the SI base unit of electric current, defined as the flow of one coulomb of charge per second through a conductor.
16. (D) Solar energy is renewable because it comes from the Sun, which provides virtually inexhaustible energy on human timescales.
17. (B) The mango tree's scientific (binomial) name is Mangifera indica, where 'Mangifera' is the genus and 'indica' means 'of India', reflecting its origin in the Indian subcontinent.
18. (C) Red blood cells (erythrocytes) contain haemoglobin, an iron-containing protein that binds to oxygen in the lungs and transports it to tissues, while also carrying CO■ back to the lungs.
19. (C) Burning of wood is a chemical change (combustion) where wood reacts with oxygen to produce carbon dioxide, water vapour, and ash — entirely new substances are formed.
20. (B) The decibel (dB) is a logarithmic unit used to measure sound intensity or loudness. Normal conversation is about 60 dB; a jet engine is about 140 dB.
21. (D) Chandrayaan-3's Vikram lander soft-landed on 23 August 2023 near the lunar south pole — a world first. The Pragyan rover then operated on the surface for ~14 days.
22. (B) CRISPR-Cas9 (Clustered Regularly Interspaced Short Palindromic Repeats) is a molecular tool that can precisely cut and edit DNA at specific gene locations.
23. (C) Stage 1: PHWRs using natural uranium. Stage 2: Fast Breeder Reactors using Pu-239 to breed U-233 from Th-232. Stage 3: Advanced reactors using Th-232/U-233 fuel.
24. (A) Article 2 of the Paris Agreement sets the goal of 'holding the increase in global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C.'
25. (D) MOM (Mangalyaan), launched November 2013, entered Mars orbit on 24 September 2014 — making India the first country to succeed on its maiden Mars attempt.