

P2

The sun gives energy out in the form of heat and light.

1. When we use wind power, we use sun's energy (heat). The sun heats the air. The hot air goes up and cold air comes down (wind); and so on.

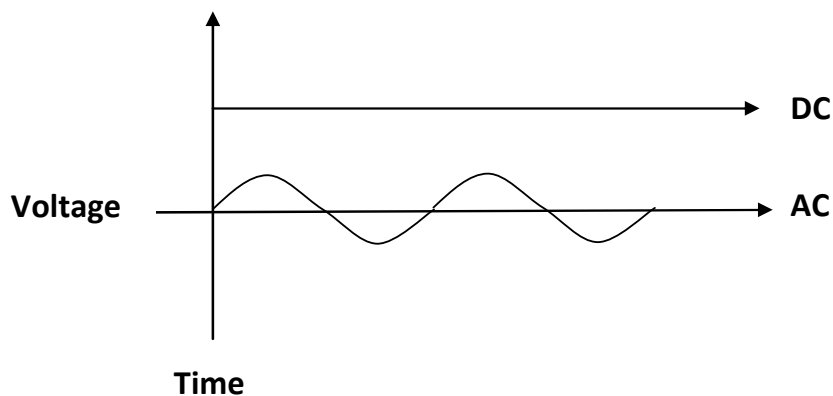
2. We can also use directly suns energy with solar cells and solar heating.

Direct current (DC) (e.g. battery):

The current flows the same way in the circuit all the time.

Alternating current (AC) (e.g. main electricity):

The current keep changing direction.



Q1: Give one reason why main electricity is A.C.

A1: Because of distribution of electricity, we need transformer and transformers only work on A.C.

FUEL energy input = ELECTRICAL energy output + WASTE energy output

$$\text{EFFICIENCY} = \frac{\text{ELECTRICAL energy output}}{\text{FUEL energy input}} \times 100$$

Q2: A coal-fired power station generates 200_{MJ} (200,000,000_J) of electrical energy per second. 450 MJ of energy is wasted per second as heat and noise. Calculate:

- a) The energy used by the power station in a second,
- b) The efficiency of the power station.

A2-a: Energy used (energy input) = energy output + energy wasted

$$= 200 \text{ MJ} + 450 \text{ MJ}$$

$$= 650 \text{ MJ}$$

A2-b:

Efficiency = energy output / energy input

$$= 200 / 650$$

$$= 0.3077 \text{ (or 30.77\%)}$$

Power (w) = voltage (v) x current (A)

Q3: Find the **current** flowing through a 100w light bulb if the voltage is 230v.

A3: **Current** = power/voltage

$$= 100/230 = 0.43 \text{ Amps}$$

Units of Energy (kwh) = power (kw) x Time (h)

Cost = No of Units x price of unit

Q4: Find the cost of leaving a 60w light bulb on for 30 minutes if one kwh costs 10p.

$$\begin{aligned}\text{Energy (kwh)} &= \text{Power (kw)} \times \text{Time (h)} \\ &= 0.06 \text{ kw} \times 1/2 \text{ h} = 0.03 \text{ kwh}\end{aligned}$$

$$\begin{aligned}\text{Cost} &= \text{No of units} \times \text{price of unit} \\ &= 0.03 \times 10 \\ &= 0.3\text{p}\end{aligned}$$

بنا به دلایلی هسته اتم (nucleus) انرژی یا چیزهایی را به بیرون تف می کند (spit out). که به این چیزهایی که به بیرون (spat) تف شده اند (nuclear radiation) می گویند.

Q5: What are **radioactive** materials?

A5: Radioactive materials are materials that give out **nuclear radiation**.

Q6: How many **type of radiation** exist, name them?

A6: There are 3 kind of radiations.

1. Alpha (α)
2. Beta (β)
3. Gamma (γ).

All of these 3 radiations can cause **IONISATION**.

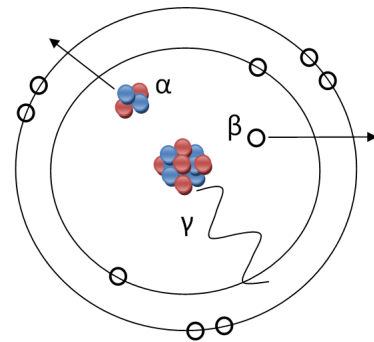
This makes atom into **positive ions**.

آیونیزیشن یعنی از دست دادن یک الکترون، که برای سلامت بدن خطرناک است.

The electron that has been lost can be gained, by another atom, making it **negative ions**.

Alpha (α) particles:

They are **big, heavy,** and **slow moving**.



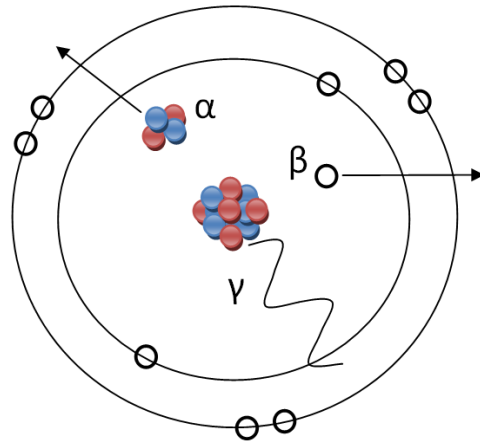
(they are 2 protons and 2 neutrons). $(\begin{matrix} \bullet & \bullet \\ \bullet & \bullet \end{matrix}) = \alpha$

1- Because of their **size** they are **stopped** quickly, **α** particles can be stopped by **paper** or **skin** or a **few centimetres** of air.

2- Because **α** particles are **big**. They hit to other atoms and **knock electrons** (پرت کردن) off them.

Beta (β) particles:

They are just electrons so they are **small**, and move **faster** than Alpha particles.

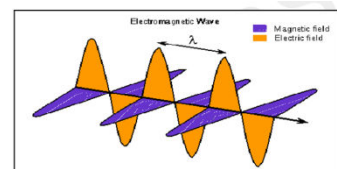


(این الکترونها از درون هسته می آیند اینها را با الکترونهايي که دور هسته می چرخند اشتباه نگیرید).

1) Beta particles can be stopped by **thin sheet (3 to 5 millimetres)** of aluminium.

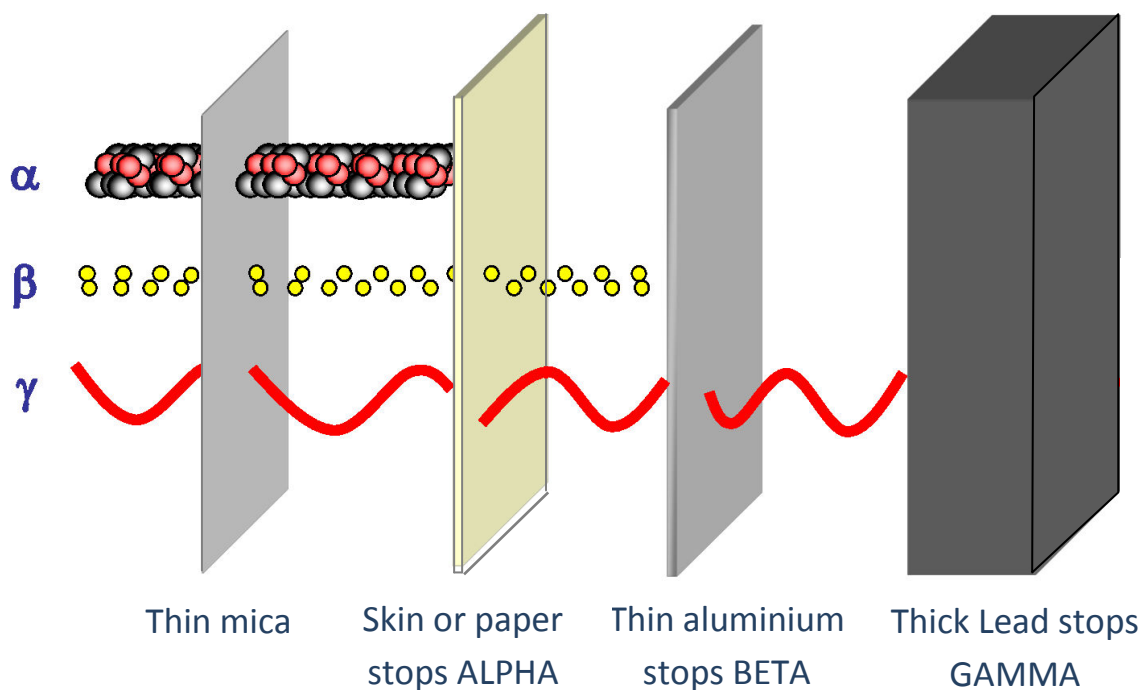
Gamma rays (γ):

1. After α or β radiation, nucleus needs to get rid of extra energy. It does this by **emitting** a Gamma ray (γ). Gamma rays are very **high frequency electromagnetic waves**.



- Gamma rays have **no mass** and **no charge**. They can penetrate a long way into materials (**so they can go through atoms, and they don't collide with atoms**).
- They can be stopped by **metres of concrete** or **thick lead**. (سرب که نوعی فلز است)

The penetration power of the three types of radiation.



i. Alpha (α) radiation is used in **smoke detectors**.

ii. Beta (β) radiation can be use for **medical use** in tracing. Doctors use **Beta** and **Gamma** because they can pass out of the body.

Beta (β) radiation can also be used in **factory** making **papers** or **card board** to control the **thickness** of paper or card board.

These are used because they can go through the papers, and if they don't go through then the controller does not work.

iii. Gamma (γ) radiation has **medical** and **industrial** use. A lot of Gamma rays can

kill all living cells so they can be use to **kill cancer's cells** (سلولهای سرطانی).

Gamma rays are also used to **sterilise** medical instrument, as it **kills all the microbes**.

Gamma rays are also used in industry, e.g. **air lines can check the jet engines to see if it is ok, or not.**

Q7: How can you identify (α), (β), or (γ)?

A7: They can be identified by finding out what **material** they can **penetrate**.

Q8: What is ionisation power of (α), (β), and (γ)?

A8: (α) = Strong, (β) = Reasonable, (γ) = Weak.

Q9: What is the universe made up of?

A9:

- 1. Planets, Comets, Meteors**
- 2. Stars**
- 3. Galaxies**
- 4. Black holes.**

1. The earth's **North magnetic pole** is at **South Pole.**

2. The earth's **South magnetic pole** is at **North Pole.**

Q7: What causes the **magnetic field** in the earth?

The earth's **molten iron core** and **electric current in the liquid** causes the magnetic field.

Q8: What doe **solar flares** (Big explosion) on the **sun** releases?

A8:

- 1. Gamma rays (γ).**
- 2. X-rays.**
- 3. Charged particles.** (The earth magnetic field, shields us from charged particles).

Q9: What sort of **problems** can **Solar flares** cause?

A9:

- 1-** It can **damage man made** satellites for:
 - a. Communication** satellites
 - b. Weather forecasts** satellites
 - c. Spying** satellites
 - d. GPS: navigation** satellites.

2- It interacts with Earth's magnetic field, and cause power surges in electricity.

Cosmic rays cause the Aurora Borealis in the North Pole and Aurora Australis in the South Pole.

They are 8 planets in our solar system, (in fact 9 planets, but the last one used to be called Pluto which now it is called the dwarf planet as it is not a proper planet).

The nearest star to earth is sun.

- 1. Inner planets: Mercury, Venus, Earth and Mars.**
- 2. Asteroid belt: millions of asteroid (rocks) between Mars and Jupiter.**
- 3. Outer planets: Jupiter, Saturn, Uranus and Neptune.**

Q10: What are the difference between **stars** and **plants**?

A10:

<u>Stars</u>	<u>Planets</u>
Huge	Smaller
Faraway	Nearer

Hot	Cold
Give out light	Reflect light
No moon(s)	Have moon(s)

Q10: What is centripetal force?

A10: A force that causes a **circular motion** is called a centripetal force, which is provided by gravity.

Q11: What is Meteors?

A11: Shooting stars are called **Meteors**.

Q12: What is Meteorites?

A12: Meteorites are Meteors (rocks) that have crashed to earth.

Q13: What is Comets?

A13: Comets are balls of rock, dust and ice which **orbit the sun** (like planets do) sometimes they can be **polled** towards the sun leaving a bright tale behind.

Q14: What is near earth objects (NEOs)?

A14: Near earth objects (NEOs), are asteroid and comets which might be on a collision with earth.

Q15: How Distance is measured in space?

A15: Distance is measured in space using light years.

Q16: What is light year?

A16: The **distance** that **light** travel trough a **vacuum** in **one year** is called light year.

Q17: What is the distance of **nearest star** to earth?

A17: Nearest **star** to our solar system is 4.2 light years away

Q18) What is the end stage of heavy-weight stars?

A18):

i. End stages of a heavy-weight star:

- 1.** Star swells up to form a **red supergiant**.
- 2.** The red supergiant rapidly **shrinks** and **explodes**, releasing massive amounts of **energy, dust** and **gas** into space. This is a **supernova**.
- 3.** The next stage depends on the size of the star:
 - a.** Stars **smaller** than, **ten times the mass of our Sun**, form a **neutron star**, which is made of very dense matter.
 - b.** Stars **greater** than **ten times the mass of our Sun** leave behind a **black hole**

Q19) What is the end stage of medium-weight stars?

A19):

ii. End stages of a medium-weight star (like our sun):

1. Star swells up to form a **red giant**.
2. The **core** of the red giant **shrinks** to be surrounded by **outer_shells** of gas (**planetary nebula**).
3. The core **cools** and **shrinks** to become a **white dwarf**, with a **density thousands of times greater than any matter on earth**.

Q20) How can we observe the effects (proof the existence) of a black hole?

A20): Black holes can only be observed indirectly through their **effects to on their surroundings** – light cannot escape from a black hole because its gravitational pull is too big.

Q21) What is the **Ptolemaic model** of the Universe?

(What is the **geocentric model** of the Universe?)

A21): The **Ptolemaic model** stated that the Earth was the centre of the Universe (the **geocentric model**) and that the Earth was surrounded by crystal spheres which held the other planets and the stars.

Q22) What is the **Copernican model** of the Universe?

A22):

1. The **planets sat on spheres**, at a fixed distance from the Sun.
2. The **stars were fixed** on the outermost sphere and **didn't move**.

Q23) What is the different between the **Copernican model** and the **Ptolemaic model**?

A23): It differs in the following ways:

1. The **Sun** is the **centre of the Universe**
2. The **Earth rotated** once every **24 hours**
3. The Earth takes **one year to revolve** around the **Sun**.

Q23) What did **Galileo** discovered?

A23):

- 1.** He discovered that the moon **wasn't** a perfect sphere.
- 2.** He also discovered **four moons** orbiting Jupiter.
- 3.** He later discovered that **Venus** was like the **moon** (which meant that Venus couldn't be attached to a crystal sphere). **It orbited the Sun, like the earth.**

Advantages of unmanned probes:

- 1.** They don't have to carry water, food, and oxygen.
- 2.** They can work in extreme heat, cold or radiation but people can't.
- 3.** With no people on, more instruments can be fitted in.
- 4.** It is cheaper because they carry less, and they don't have to come back.
- 5.** If an accident happens it is bad, you lose your time and money but not life.

Disadvantage of unmanned probes:

- 1-** Machines can't think for themselves but people can.
- 2-** Machines can't do maintenance and repairs, but people can do.

All the distant galaxies are moving away from us at great speed.

Distant galaxies are moving away faster than near ones. The universe is 14 billion years old.