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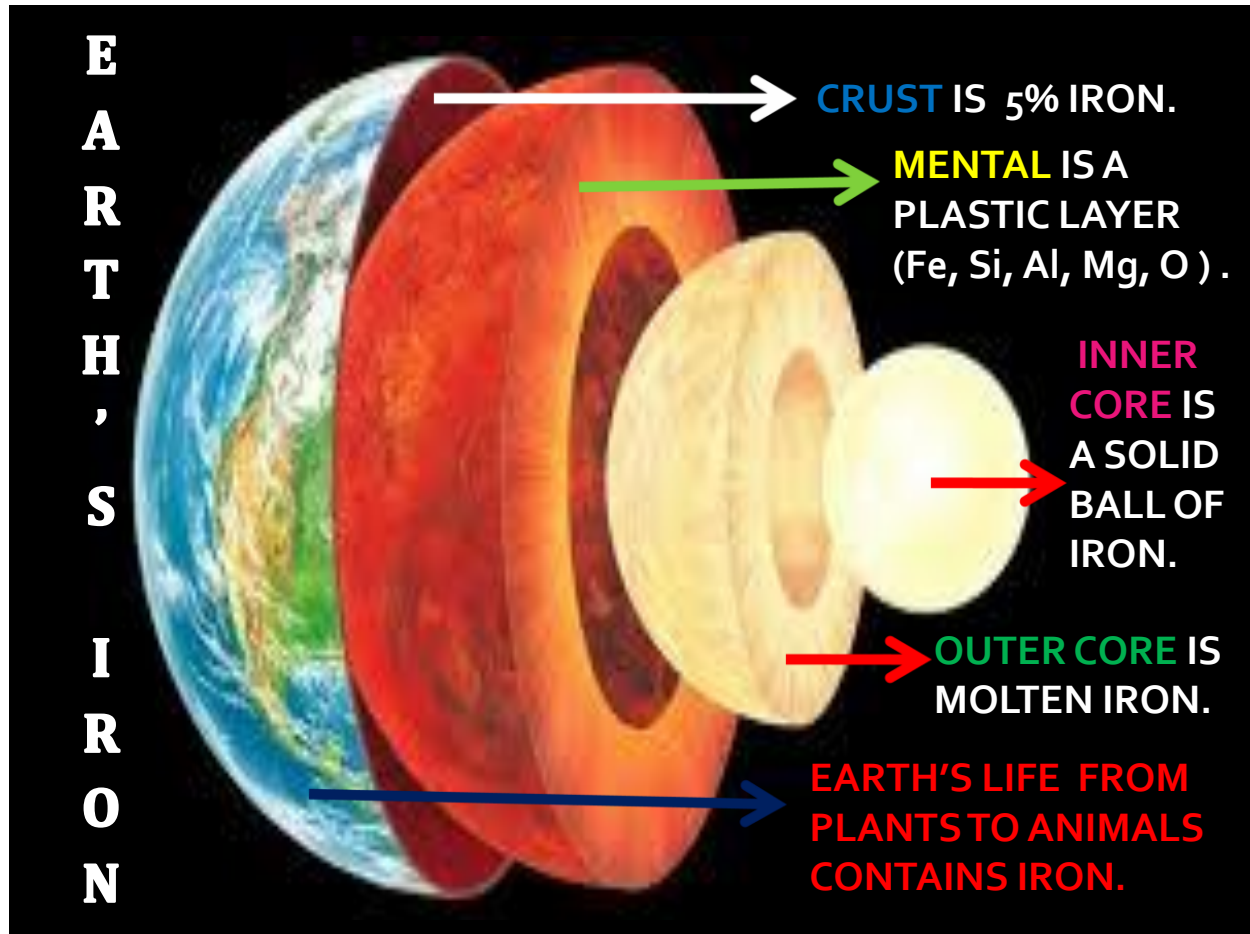
# IRON...الحديد

Symbol: Fe  
Atomic Number: 26  
Atomic Weight: 55.845  
Classification: Transition *metal*  
Phase at Room  
Temperature: Solid  
Density: 7.874 grams per cm  
cubed  
Melting Point: 1538°C, 2800°F  
Boiling Point: 2862°C, 5182°F  
Known since ancient times



1 H																	2 He															
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne															
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar															
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr															
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe															
55 Cs	56 Ba			72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn														
87 Fr	88 Ra			104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn																				
																		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
																		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

# IRON IN OUR EARTH



Iron is the sixth most common element in the universe.

Iron forms one third of our earth's mass.

It is the most stable element i-e it has the strongest nucleon binding force.

Iron exists in many different oxidation states.

While iron is often found in environments that are low on oxygen, it is highly reactive to both oxygen and water.

Iron often appears as a lustrous silver color, but oxidizes to rust in air.

Pure elemental iron is actually quite soft.

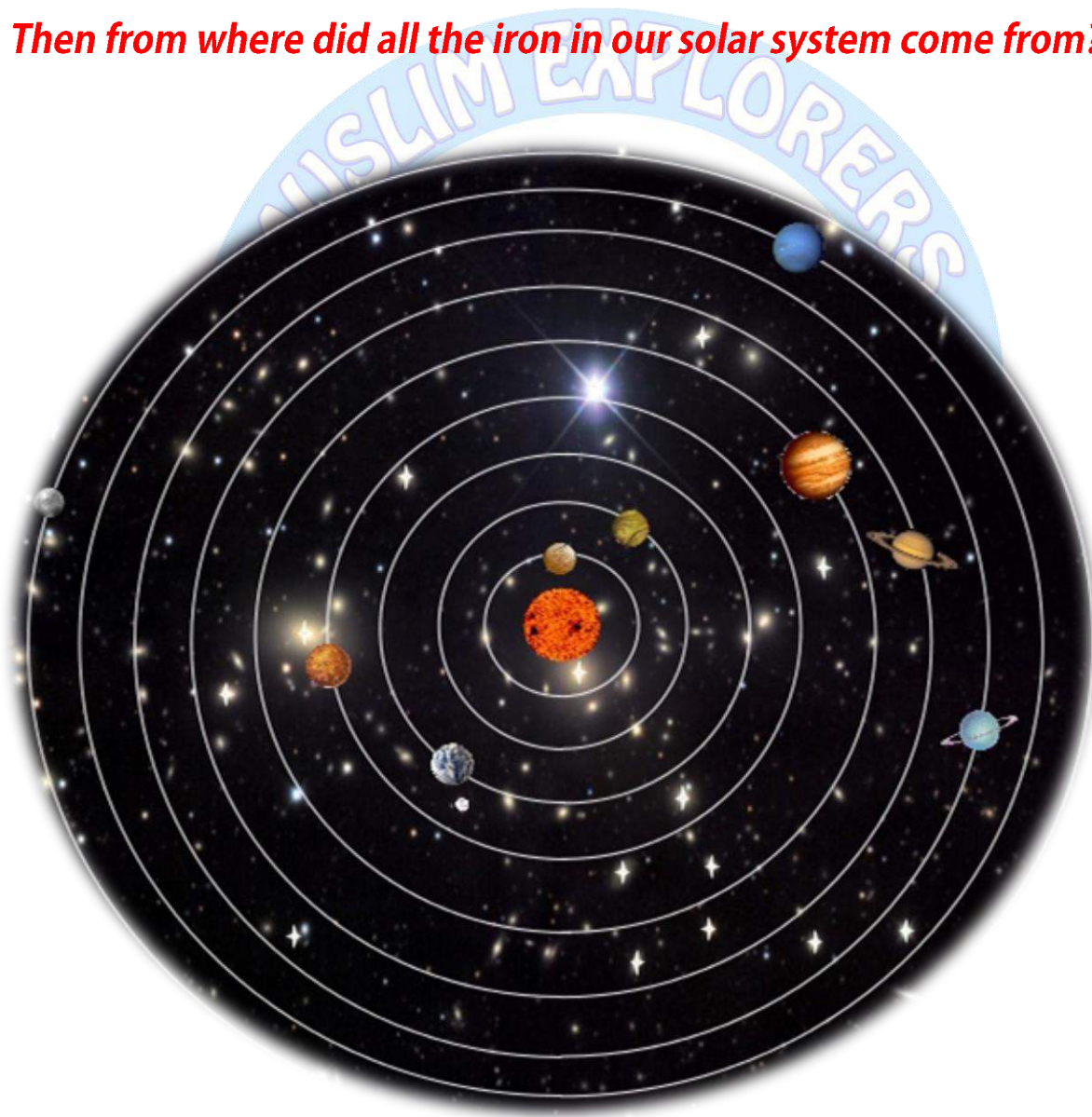
Iron is one of the major reasons for survival of life on our planet.

# IRON FORMATION

Formation of iron requires a very high temperature. Iron can only be produced when the temperature reaches a few **100 million degrees!**

*Which neither our earth nor our solar system has ever experienced, not even a fraction of it!*

***Then from where did all the iron in our solar system come from?***



***To answer this let us explore the HOLY QURAN!***

# INSPIRATION... القرآن الكريم

لَقَدْ أَرْسَلْنَا رُسُلَنَا بِالْبَيِّنَاتِ وَأَنْزَلْنَا مَعَهُمُ الْكِتَابَ  
وَالْمِيزَانَ لِيَقُومَ النَّاسُ بِالْقِسْطِ وَأَنْزَلْنَا الْحَدِيدَ فِيهِ بَأْسٌ  
شَدِيدٌ وَمَنْفَعٌ لِلنَّاسِ وَلِيَعْلَمَ اللَّهُ مَن يَنْصُرُهُ وَرُسُلَهُ بِالْغَيْبِ إِنَّ اللَّهَ  
قَوِيٌّ عَزِيزٌ

We have already sent **Our messengers with clear evidences and sent down with them the Scripture and the balance** that the people may maintain [their affairs] in justice. And **We sent down iron, wherein is great military might (strength) and benefits for the people**, and so that Allah may make **evident** those who support Him and His messengers unseen. Indeed, Allah is Powerful and Exalted in Might.  
(Quran, Surah Al-Hadid,56)

# وَأَنْزَلْنَا الْحَدِيدَ

## WE SENT DOWN IRON



أَنْزَلْنَا

**ROOT WORD:** (نزل) Nun-Zay-Lam

**MEANINGS:** To descend, come down, Go down, happen, Alight at, Settle in a place, lodge.

- ✓ **MANZIL** - Mansion, Station.
- ✓ **ANZALA** - To send down, Give.
- ✓ **NAZZALA** - To cause to descend, send down.
- ✓ **TANZIL** - Sending down, Divine revelation, Orderly arrangement

**INTERPRETATION OF THE VERSE:** Iron was probably physically sent down from the space beyond our solar system.

# THE STARS

Our sun is one of about **100 billion** stars in our galaxy Milky Way.

A star is a massive, bright, sphere of very hot gas called **Plasma** which is held together by its own **gravity**.

Stars are giant nuclear reactors. They get their fuel by **Nuclear Fusion** in their centers. i-e nuclei combine to form a stable one (for example common stars burn hydrogen into helium).



## LOW MASS STAR

- $<8M_{\odot}$  less than 8 solar masses



## HIGH MASS STARS

- $>8M_{\odot}$  greater than 8 solar masses

IRON can only be formed in the core of **massive** stars (high mass stars). They are much larger than our sun. Here the temperature rises up to a few 100 million degrees, perfect for the formation of iron. But this process of iron formation kills them!

## What do you think how a star dies?

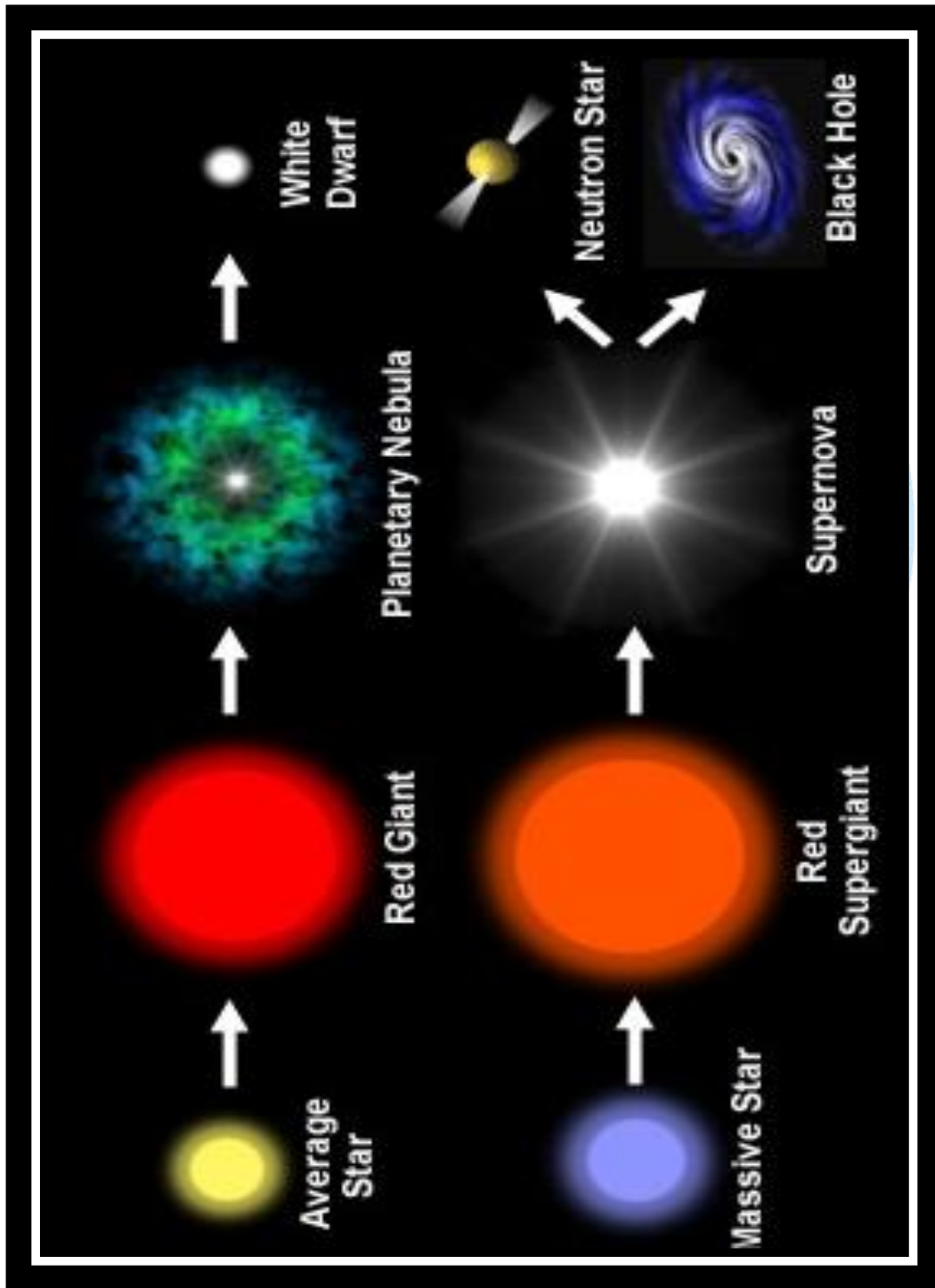
# LIFE OF STARS

- ❖ A star **burns energy** and glows for about **billions of years**.
- ❖ This is called the “main sequence stage.”
- ❖ A star spends majority of its life in this state.
- ❖ In this stage a **balance** is met between **gravity** wanting to shrink the star and **heat** wanting to make it grow bigger.
- ❖ This is the stage our **SUN** is currently in.
- ❖ When a star runs out of fuel, it starts **dying**.
- ❖ Its center shrinks and the outside expands.
- ❖ It becomes a **RED GIANT** or a **SUPER RED GIANT** depending upon its starting mass.
- ❖ The fate of a star is determined by its mass:
- ❖ **LOW MASS STARS**
- ❖ They become small “**white dwarfs**” stars which will emit white light until they finally darken into “**black dwarfs**”.
- ❖ **HIGH MASS STARS**
- ❖ They have shorter lives as they consume their fuel faster.
- ❖ They explode as massive bright **SUPERNOVA**.
- ❖ The explosion leaves behind:
- ❖ Either a small “**neutron star**”, which is entirely composed of neutrons. A teaspoon of which weights a few tons.
- ❖ Or a “**black hole**” which is so dense that light, cannot overcome its density.



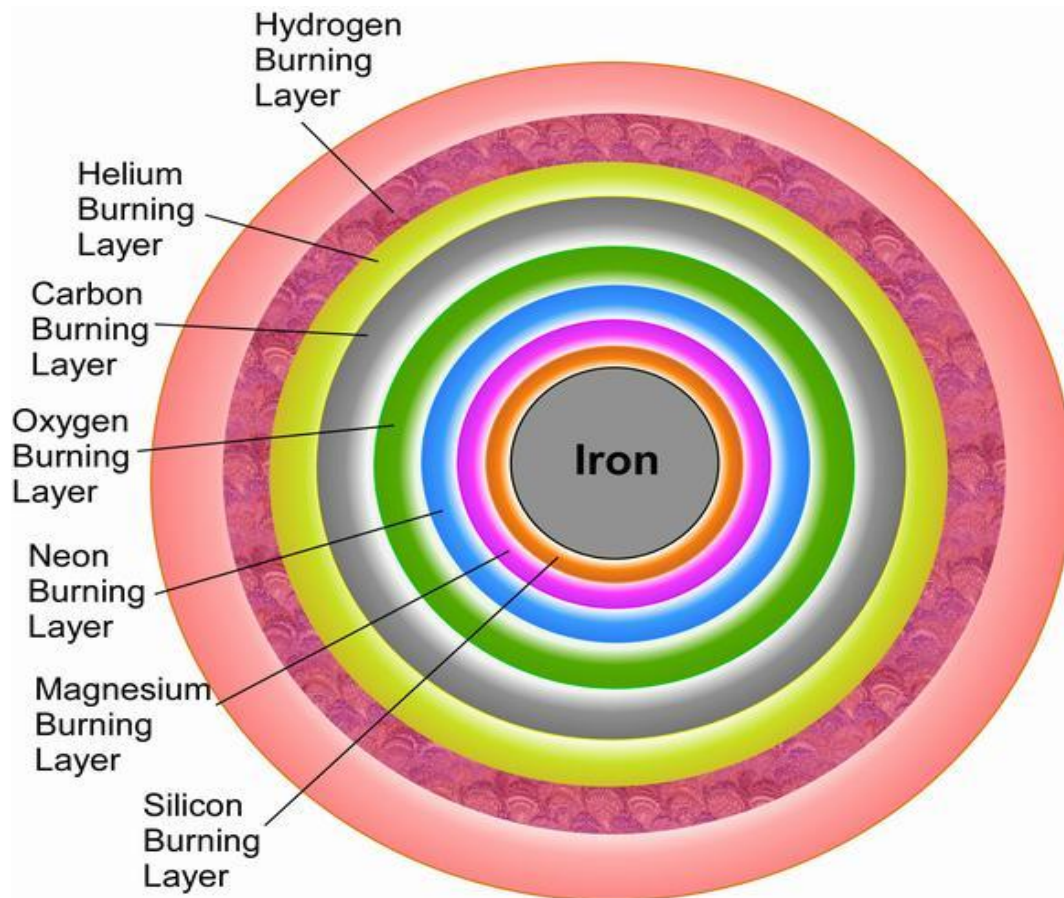


# LIFE OF STARS



# **SUPERNOVA**

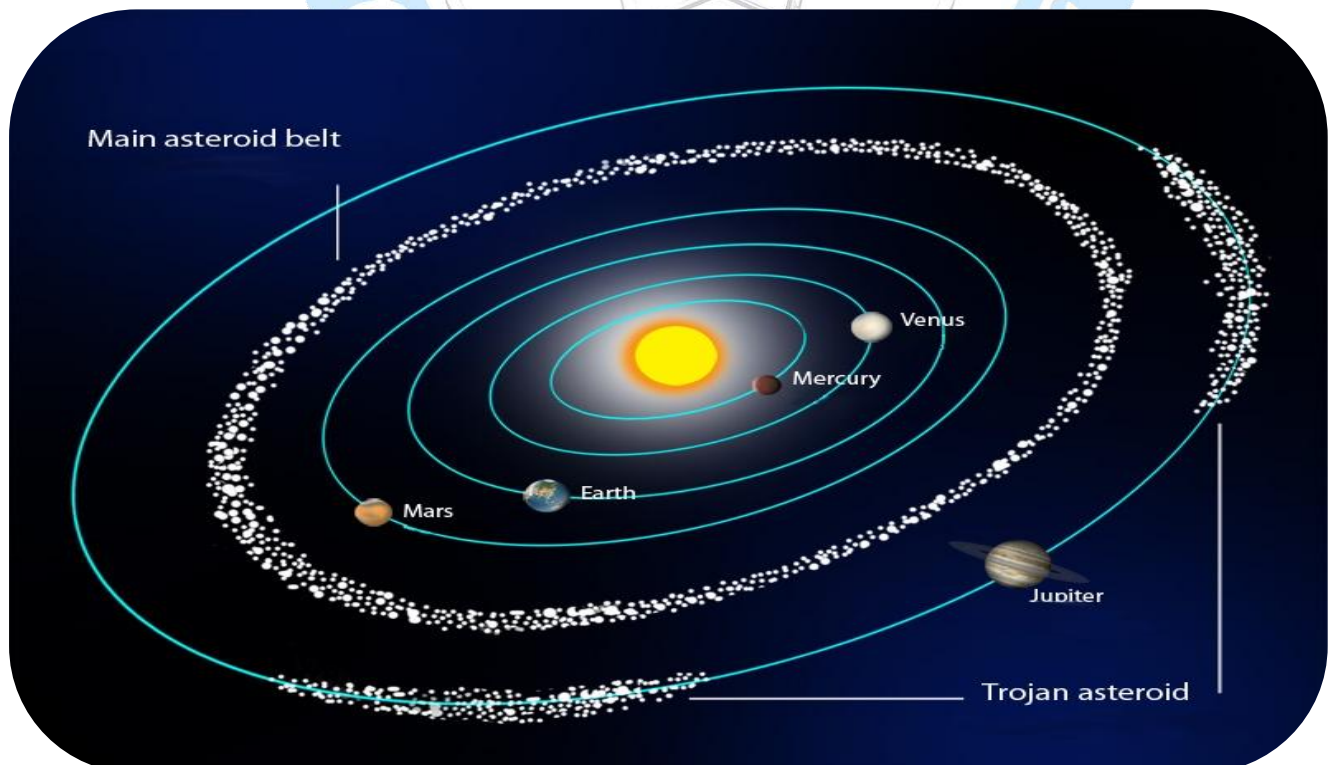
## **(THE EXPLODING STAR)**



- ❖ After the hydrogen burning phase is over the star changes in various steps into a Nova.
- ❖ In this stage IRON and other heavy elements are formed.
- ❖ The internal combustion results in immense amount of pressure and the Nova explodes into a Supernova.
- ❖ This result in shattering of IRON into space, which is ultimately attracted by other cosmic bodies.
- ❖ The earth might have obtained its iron through asteroids or meteoroids.

# ASTEROID (MINOR PLANET)

- ✓ It is composed of rock, metal or a mixture of both.
- ✓ Diameter from 775 km to less than one mile (1.6 km).
- ✓ They revolve about the sun in orbits lying mostly between Mars and Jupiter.



# METEORITE



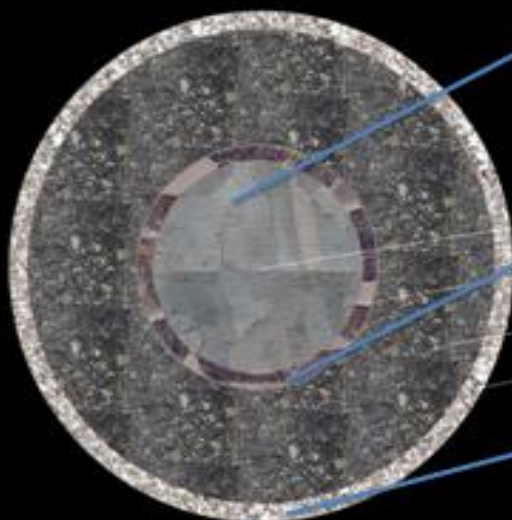
A colliding asteroid scatter fragments into space.

Rarely these fragments encounter our planet.

Most of them explode on their way.

Those survive and land upon Earth's surface are meteorites.

## TYPES OF METEORITES



AN ASTEROID

Iron core (iron meteorites)



Mantle (Stony-iron meteorites)



Rocky crust (Stony meteorites)



فِيهِ بَأْسٌ شَدِيدٌ

...wherein is great military might



From old age to the modern warfare iron is the core of this industry!

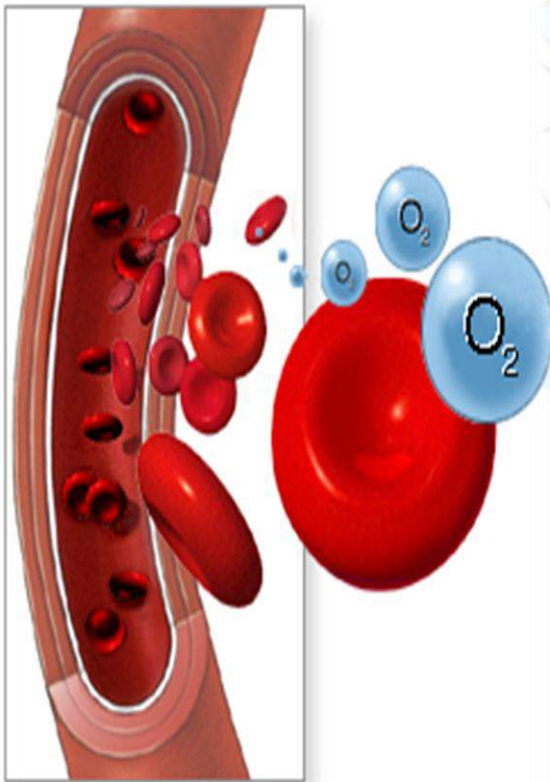
وَمَنْفَعٌ لِلنَّاسِ

## ...and benefits for the people

Of all the metals there is none more essential to life than IRON!

- ❖ Plants use iron in chlorophyll which is used in photosynthesis.
- ❖ Humans use iron in hemoglobin molecules to carry oxygen.
- ❖ Iron is also essential for human body and brain development.

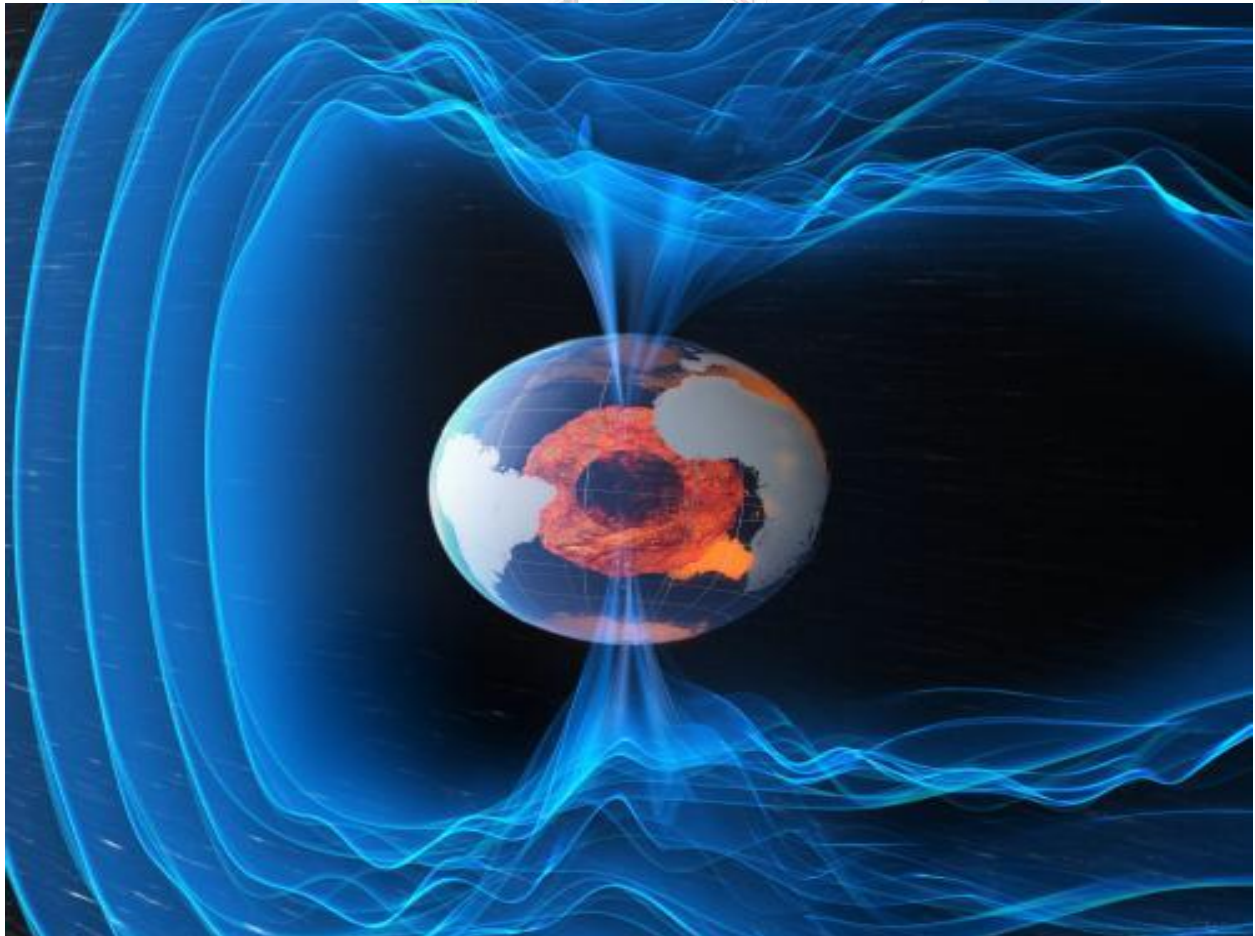
RBC' s (THE OXYGEN CARRIERS)



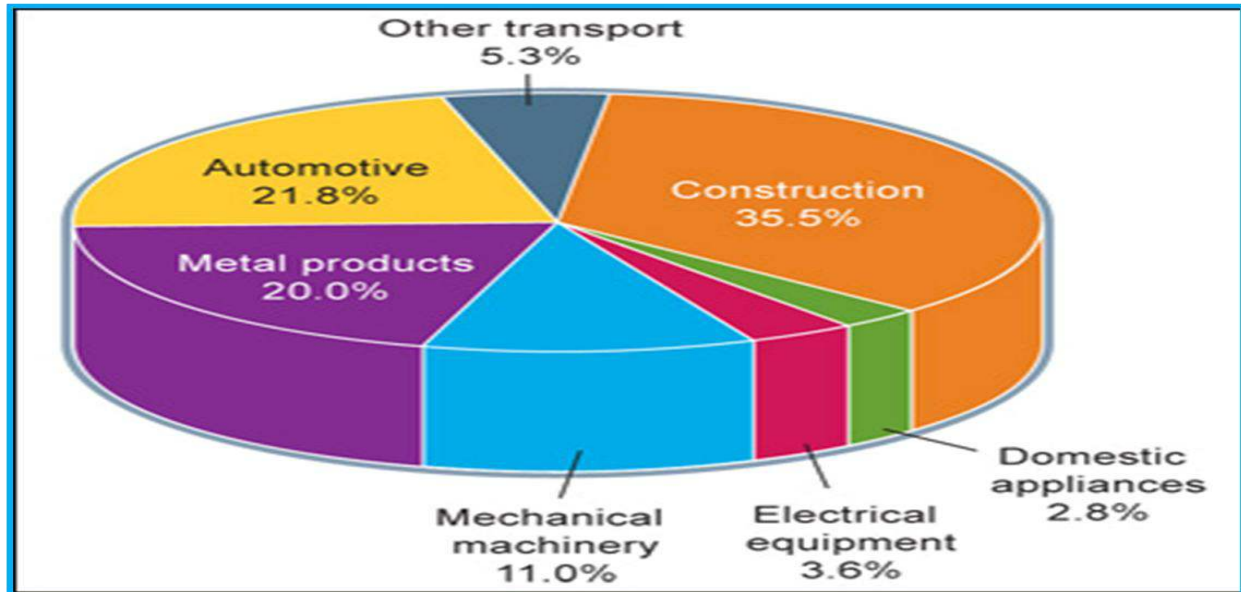
Fe-deficiency symptoms  
(younger leaves of lemon)



- ❖ Circulation of liquid iron deep in the earth creates our planets magnetic field.
- ❖ This field saves our earth form dangerous solar radiations.
- ❖ It is the main reason for the existence of our atmosphere and ozone layer.
- ❖ Thus in turn it is the reason for availability of liquid water on our planet, which is the basis of life.
- ❖ Many animals use this field for navigation. Humans also have been using this technique for quite a long time.



- ❖ It is the cheapest metal accounting for 95 percent of worldwide metal production. Iron is used to manufacture steel and other alloys.





# TEST YOURSELF!

1. Can you recall the word for iron in Arabic?

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(Hint: It's the name of the Surah of Qur'an in which iron is mentioned)

2. What do you think? Why is iron the most stable element?

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3. What conditions are required to form Iron?

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4. What do you think? From where did the Earth get its Iron?

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5. Where in the universe Iron is formed?

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6. Do you know what stars are? And do they also die?

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7. Can you explain what a Supernova is?

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8. Under what circumstances a star suffers a supernova?

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9. Do all stars end up into Supernova?

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10. What is an asteroid?

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11. Can you tell where does the asteroid belt of our solar system is?

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12. Can you guess what type of meteorite is this?

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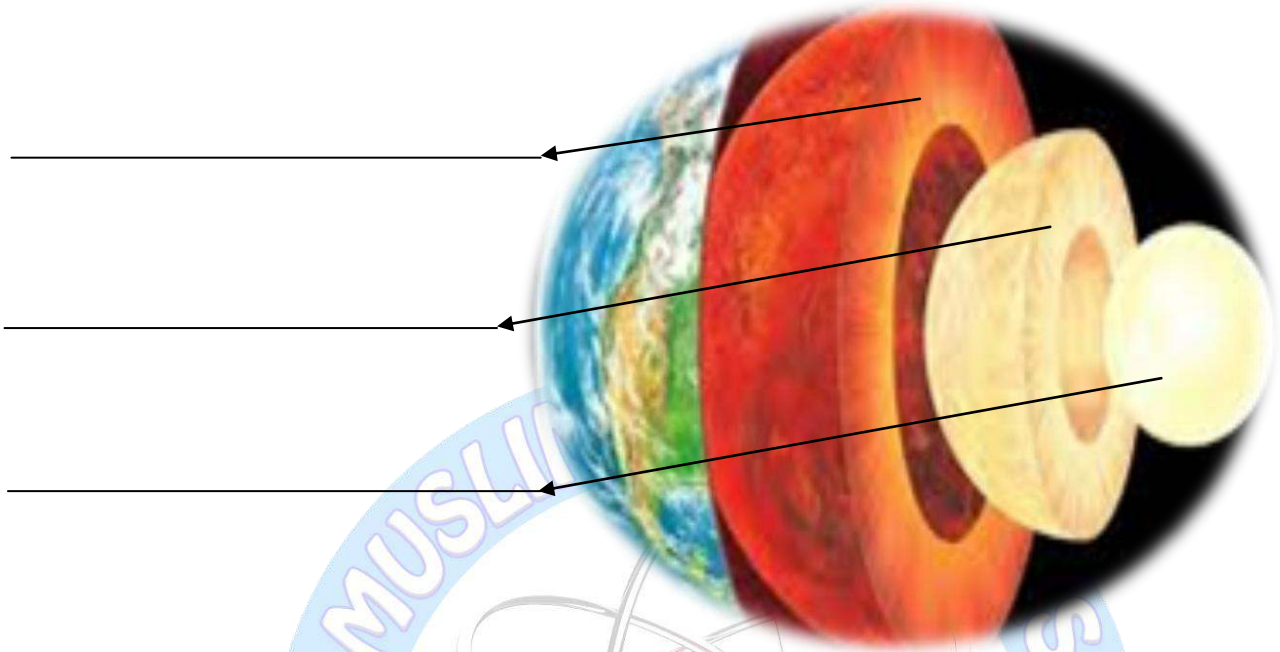
13. Can you name some other types of meteorites?

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14. From where do meteorites come from?

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15. What do you think the earth is made up of?



16. Why do plants and animals need iron?

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17. Can you name any four iron rich foods?

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18. How does iron protects our lives?

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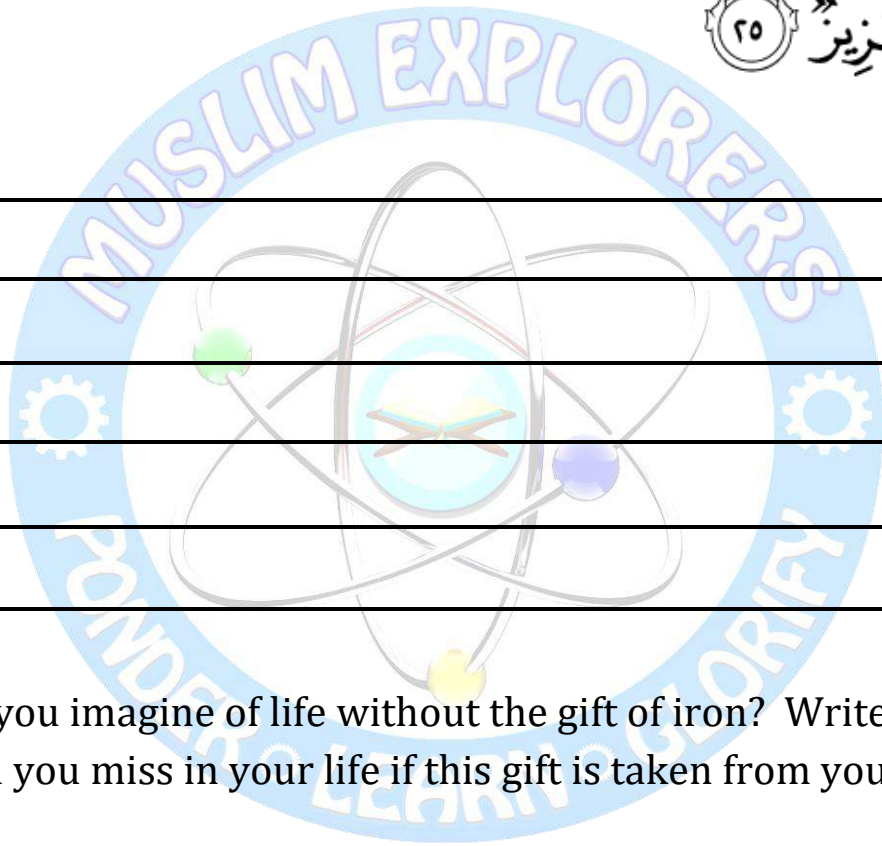
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19. Can you name a few iron rich foods?

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20. Can you now briefly explain this verse?

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قَوِيٌّ عَزِيزٌ ﴿٢٥﴾



21. What can you imagine of life without the gift of iron? Write about what would you miss in your life if this gift is taken from you?

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