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7

17

20

FCC $\quad 3.2\ gm/cc \longrightarrow PF = 74\%$

$3.0\ gm/c \longrightarrow PF$

$$\frac{3.2}{3.0} = \frac{74}{PF}$$

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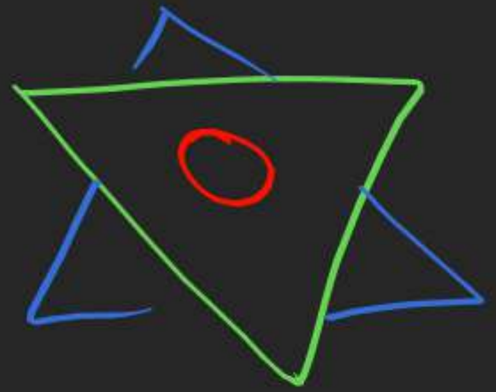
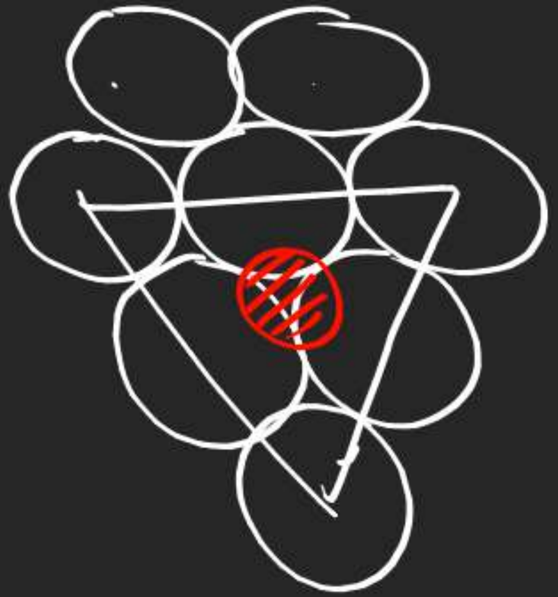
NaCl

$SrCl_2$



$2S (R)$



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$CsCl \longrightarrow \sqrt{3}a/2 \longleftarrow Cs^+ — Cl^-$

CaF_2 Two cation $Ca^{2+} — Ca^{2+}$ $a/\sqrt{2}$

$C — C$ $\sqrt{3}a/4$

SC $\xrightarrow{2^{nd}\ \text{nearest}}$ $\sqrt{2}a$

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<u>Magnetic properties</u> of a substance mainly arises by the

1. orbital motion of e^- around the nucleus
2. Spin around its own axis

$$\text{magnetic moment} = \sqrt{n(n+2)} \ \text{Bohr Magneton (BM)}$$

$n \rightarrow$ no. of unpaired e^-

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1. Paramagnetic
2. Diamagnetic
3. ferromagnetic
4. Antiferromagnetic
5. ferrimagnetic

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Paramagnetism: Paramagnetic substances are weakly attracted by a magnetic field. They are magnetised in a magnetic field in the same direction. They lose their magnetism in the absence of magnetic field. Paramagnetism is due to presence of one or more unpaired electrons which are attracted by the magnetic field.

4 $O_2, Cu^{2+}, Fe^{3+}, Cr^{3+}$ are some examples of such substances.

Diamagnetism: Diamagnetic substances are weakly repelled by a magnetic field. H_2O, $NaCl$ and C_6H_6 are some examples of such substances. They are weakly magnetised in a magnetic field in opposite direction. Diamagnetism is shown by those substances in which all the electrons are paired and there are no unpaired electrons. Pairing of electrons cancels their magnetic moments and they lose their magnetic character.

Ferromagnetism: A few substances like iron, cobalt, nickel, gadolinium and CrO_2 are attracted very strongly by a magnetic field. Such substances are called ferromagnetic substances. Besides strong attractions, these substances can be permanently magnetised. In solid state, the metal ions of ferromagnetic substances are grouped together into small regions called domains. Thus, each domain acts as a tiny magnet. In an unmagnetised piece of a ferromagnetic substance the domains are randomly oriented and their magnetic moments get cancelled. When the substance is placed in a magnetic field all the domains get oriented in the direction of the magnetic field (Fig. 1.36 a) and a strong magnetic effect is produced. This ordering of domains persist even when the magnetic field is removed and the ferromagnetic substance becomes a permanent magnet.

<u>domains</u> → group of atom in which all the unpaired e^-'s have magnetic moment in the same direction

<u>Ferro</u> → ↑ ↑ ↑ ↑ ↑ ↑

→ <u>Antiferro</u> ↑ ↓ ↑ ↓ ↑ ↓

<u>ferrimagnetic</u> ↑ ↑ ↓ ↑ ↑ ↓

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Antiferromagnetism: Substances like MnO showing antiferromagnetism have domain structure similar to ferromagnetic substance, but their domains are oppositely oriented and cancel out each other's magnetic moment (Fig. 1.36b).

Ferrimagnetism: Ferrimagnetism is observed when the magnetic moments of the domains in the substance are aligned in parallel and anti-parallel directions in unequal numbers (Fig. 1.36c). They are weakly attracted by magnetic field as compared to ferromagnetic substances. Fe_3O_4 (magnetite) and ferrites like $MgFe_2O_4$ and $ZnFe_2O_4$ are examples of such substances. These substances also lose ferrimagnetism on heating and become paramagnetic.

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Thermodynamics

It tells us about the feasibility of a Chemical reaction or physical change with the help of 1st, 2nd & 3rd Law of T.D.

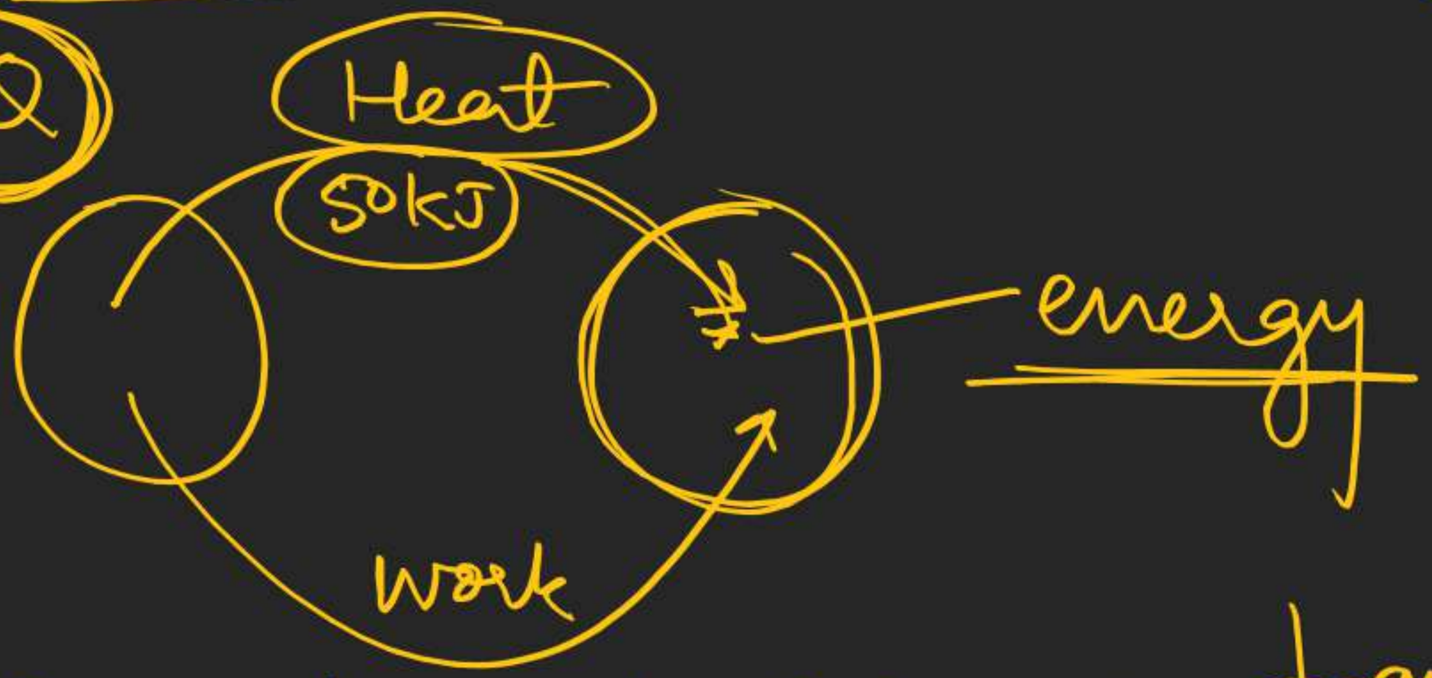
exo energy release

Heat   work   Energy

dT   dQ

ΔT

ΔU



Energy in transit mode is called heat or work

Heat & work mode of energy transfer

If energy transfer is due to temperature difference it is called heat

If energy transfer is due to some force then it known as work

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dQ = small heat transfer

~~Change in heat~~

q or Q

Small heat transfer

Large heat transfer

Energy

Kinetic energy (energy of movement)

Potential Energy (energy due to some force)

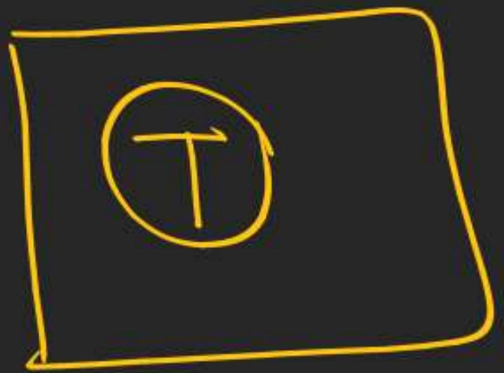
Heat

Heat energy

	$H_2O(l)$		$H_2O(g)$
	$\Rightarrow 100^\circ C$		$100^\circ C$
	KE	=	KE
translational	PE	<	PE
Rolational	energy	<	Energy
Vibration			

Note: →

Kinetic energy of a substance/system depends only on temperature



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JEE-Adv

T = 300 K

Rxn

$A + B \rightarrow C + D$

exo heat = -100 kJ
Q

At const 'T' exo PE $\downarrow$ $\Delta KE = 0$

" endo PE $\uparrow$ $\Delta KE = 0$