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DPP – 4 (Magnetism & Matter)

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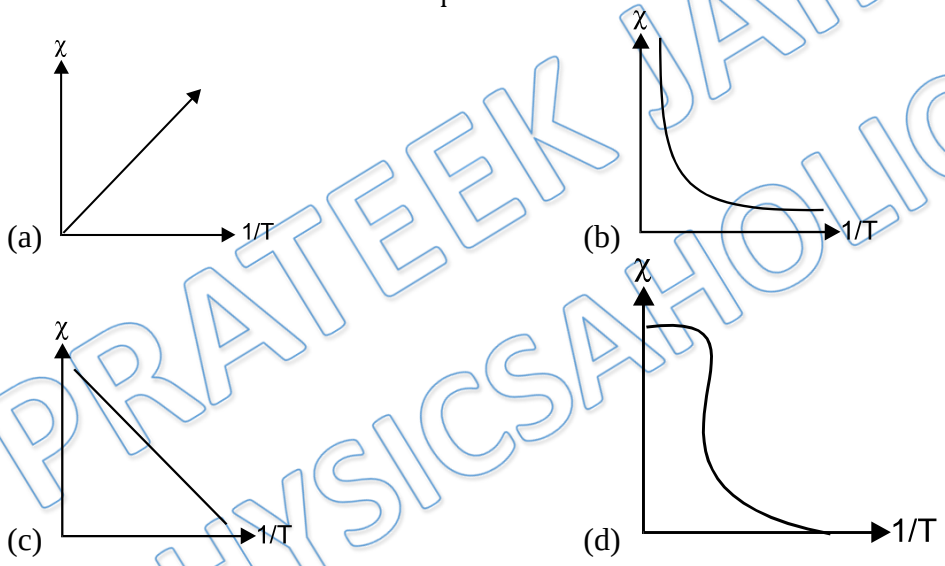
Q 1. Materials suitable for permanent magnet, must have which of the following properties?
(a) High retentivity low coercivity and high permeability
(b) Low retentivity low coercivity and low permeability
(c) Low retentivity high coercivity and low permeability
(d) High retentivity high coercivity and high permeability

Q 2. The correct curve between χ and $\frac{1}{T}$ for paramagnetic magnetic is

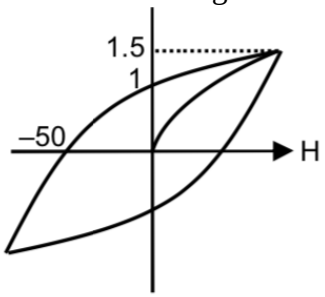


Q 3. The core of an electromagnet is made of soft iron, because –
(a) the susceptibility of soft iron is very high
(b) coercivity of soft iron is very low
(c) both of these
(d) attracts some substances and repels others

Q 4. A paramagnetic material has 10^{28} atoms/m^3. Its magnetic susceptibility at temperature 350K is 2.8×10^{-4}. Its susceptibility at 300K is:
(a) 2.672×10^{-4} (b) 3.726×10^{-4}
(c) 3.267×10^{-4} (d) 4.172×10^{-4}

Q 5. At a temperature of 30 °C, the susceptibility of a ferromagnetic material is found to be χ. its susceptibility at 333 °C is
(a) χ (b) 0.5χ
(c) 2χ (d) 11.1χ

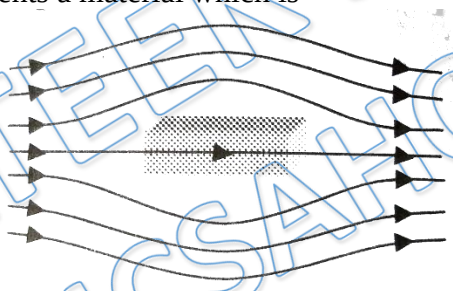
Q 6. The hysteresis curve for a material is shown in the figure. Then for the material retentivity, coercivity and saturation magnetization respectively will be:



(a) 50 A/m, 1 T, 1.5 T
(b) 1.5 T, 50 A/m, 1 T
(c) 1 T, 50 A/m, 1.5 T
(d) 50 A/m, 1.5 T, 1 T

Q 7. The hysteresis cycle for the material of a permanent magnet is
(a) Short and wide
(b) tall and narrow
(c) tall and wide
(d) short and narrow

Q 8. The given figure represents a material which is



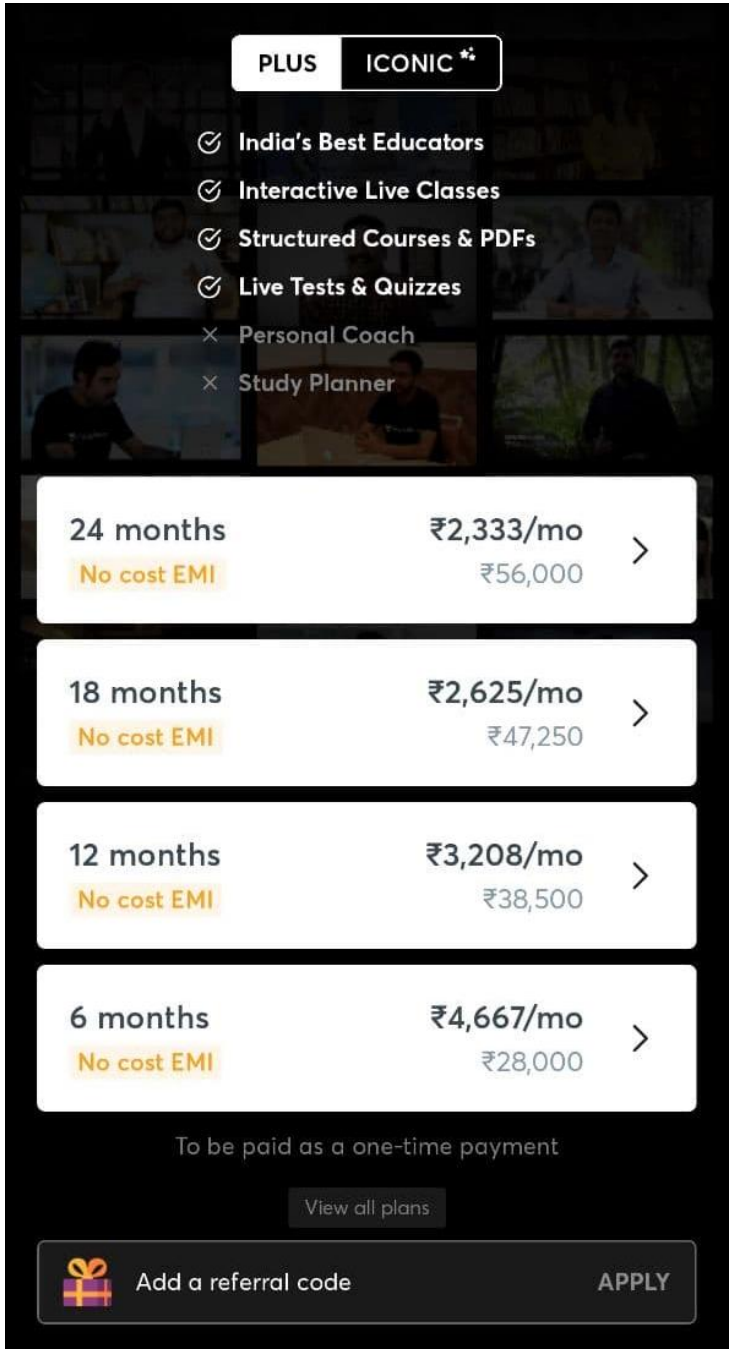
(a) Paramagnetic
(b) Diamagnetic
(c) Ferromagnetic
(d) None of these

Q 9. At curie temperature, in ferromagnetic materials
(a) the atomic dipoles get aligned
(b) the atomic dipoles lose alignment
(c) magnetism is zero
(d) none of these

Q 10. The area enclosed by a hysteresis loop is a measure of
(a) retentivity
(b) susceptibility
(c) permeability
(d) energy loss per cycle

Answer Key

Q.1 d	**Q.2 a**	**Q.3 c**	**Q.4 c**	**Q.5 b**
Q.6 c	**Q.7 c**	**Q.8 b**	**Q.9 b**	**Q.10 d**



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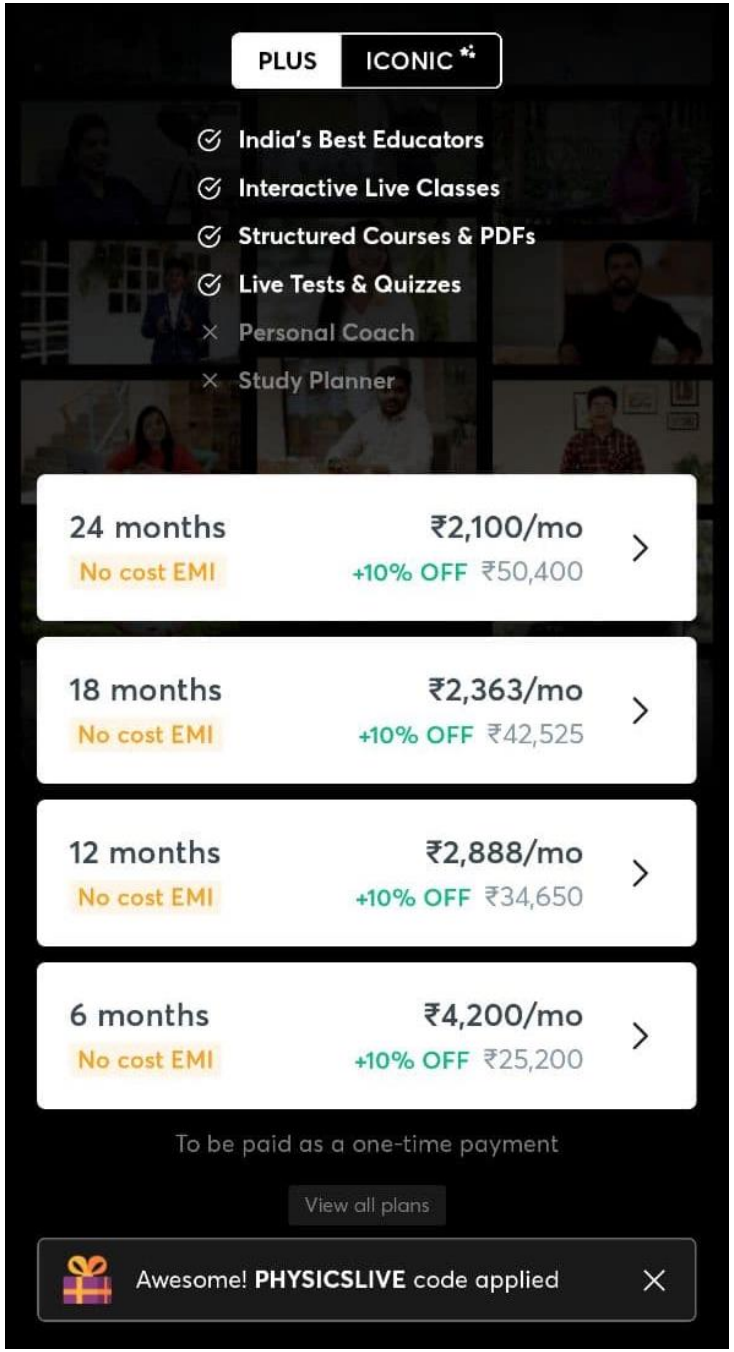


Written Solution

DPP-4 : Magnetic Properties of Matter- Curie's Law, Properties of Dia, Para & Ferro Magnetic substances, Hysteresis

By Physicsaholics Team

Solution: 1

Permanent magnet should have

i) high permeability → To magnetise it to high extent

ii) high retentivity → To retain magnetisation after removing external field.

iii) high Coercivity → To not loose magnetisation on using it in external field.

Ans. d

Solution: 2

$\chi = \frac{C}{T}$

$\chi \propto \frac{1}{T}$

So) χ v/s $\frac{1}{T}$ curve will be straight line

Ans. a

Solution: 3

Susceptibility of soft iron is very high & coercivity of soft iron is very low. So, soft iron is suitable for making electromagnets.

Ans. c

Solution: 4

$$\chi = \frac{C}{T}$$

$$\chi \propto \frac{1}{T}$$

$$\frac{\chi_1}{\chi_2} = \frac{T_2}{T_1}$$

$$\Rightarrow \frac{2.8 \times 10^{-4}}{\chi_2} = \frac{300}{350}$$

$$\chi_2 = 2.8 \times 10^{-4} \times \frac{350}{300}$$

$$\boxed{\chi_2 = 3.267 \times 10^{-4}} \quad \text{Ans.}$$

Ans. c

Solution: 5

$$\chi \propto \frac{1}{T}$$

$$\frac{\chi_1}{\chi_2} = \frac{T_2}{T_1}$$

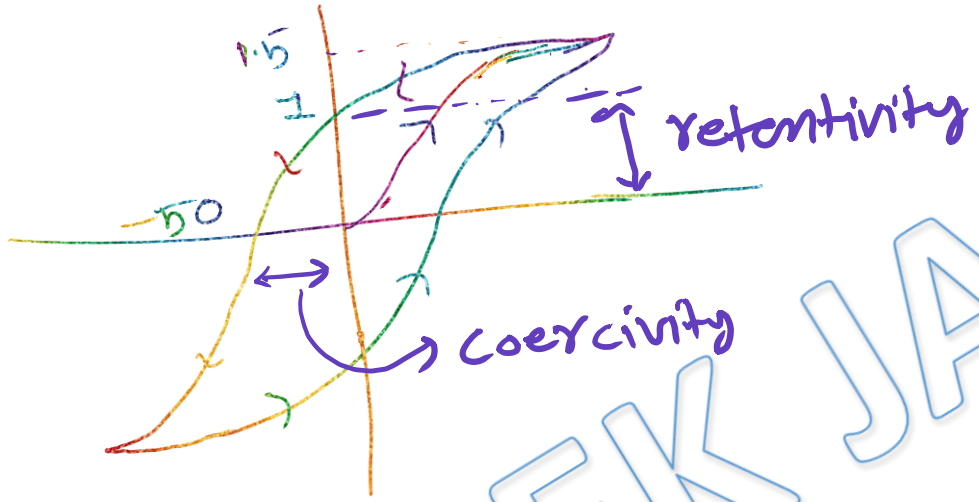
$$\Rightarrow \frac{\chi}{\chi_2} = \frac{(273+333)}{(273+30)}$$

$$\chi_2 = \frac{303}{606}\chi$$

$$\boxed{\chi_2 = 0.5\chi} \quad \text{Ans.}$$

Ans. b

Solution: 6



$\therefore$ retentivity = 1 T

Coercivity = 50 A/m

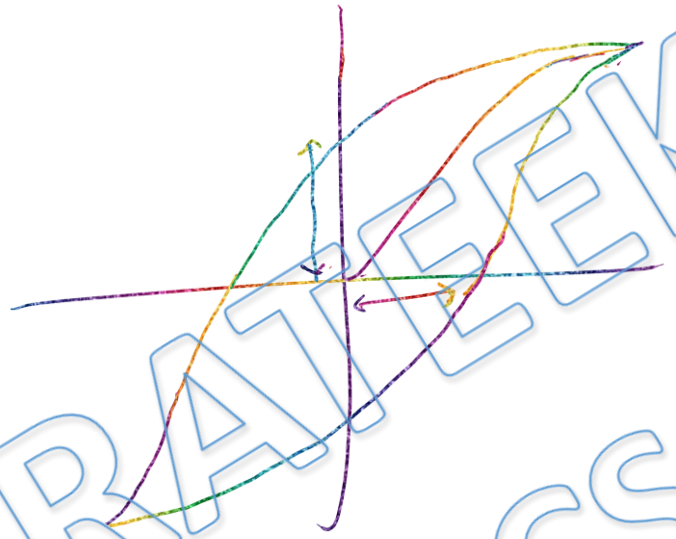
Saturation Magnetization = 1.5 T

Ans. c

Solution: 7

Most suitable materials for Permanent magnet are those which have high retentivity and high coercivity.

So;



So; Hysteresis cycle will be tall and wide.

Ans. c

Solution: 8

In the given figure, since magnetic field line move away from the substance, it represent a diamagnetic substance.

Ans. b

Solution: 9

As the temperature is increased, the randomization of individual atomic magnetic moments increases, decreasing the magnetization I for a given magnetic intensity H. And if a ferromagnetic material is heated, at curie temperature it becomes paramagnetic.

Ans. b

Solution: 10

The area of the hysteresis loop is proportional to the thermal energy developed per unit volume of the material as it goes through the hysteresis cycle.

Ans. d

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