



# PHYSICS

## BOOKS - DISHA PHYSICS (HINGLISH)

### MAGNETISM AND MATTER

#### Physics

1. Two identical magnetic dipoles of magnetic moments  $1.0Am^2$  each are placed at a separation of  $2m$  with their axes

perpendicular to each other. What is the resultant magnetic field at a point midway between the dipoles?

A.  $5 \times 10^{-7} T$

B.  $\sqrt{5} \times 10^{-7} T$

C.  $10^{-7} T$

D.  $2 \times 10^{-7} T$

**Answer:**



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2. Two identical thin bar magnets, each of length  $L$  and pole strength  $m$  are placed at right angles to each other, with the N pole of one touching the S-pole of the other. Find the magnetic moment of the system.

A.  $1 ml$

B.  $2 ml$

C.  $\sqrt{2}ml$

D.  $ml/2$

**Answer:**



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3. the magnetic lines of force inside a bar magnet

A. are from north-pole to south-pole of the magnet

B. do not exist

C. depend upon the area of cross-section of the bar magnet

D. are from south-pole to north-pole of the magnet.

**Answer:**



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4. Relative permittivity and permeability of a material  $\epsilon_r$  and  $\mu_r$ , respectively . Which of the following values of these quantities are allowed for a diamagnetic material?

A.  $\epsilon_r = 0.5, \mu = 1.5$

B.  $\epsilon_r = 1.5, \mu_r = 0.5$

C.  $\epsilon_r = 0.5, \mu_r = 0.5$

D.  $\epsilon_r = 1.5, \mu_r = 1.5$

**Answer:**

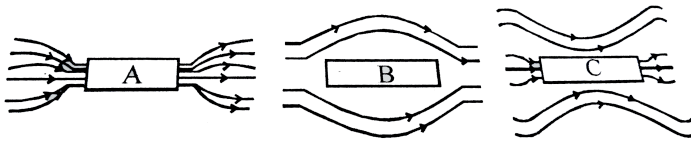


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5. Three identical bars A, B and C are made of different magnetic materials. When kept in a uniform magnetic field, the field lines around

them look as follows:

Make the correspondence of these bars with their material being diamagnetic (D), ferromagnetic (F) and paramagnetic (P):



A.  $A \leftrightarrow D, B \leftrightarrow P, C \leftrightarrow F$

B.  $A \leftrightarrow F, B \leftrightarrow D, C \leftrightarrow P$

C.  $A \leftrightarrow P, B \leftrightarrow F, C \leftrightarrow D$

D.  $A \leftrightarrow F, B \leftrightarrow P, C \leftrightarrow D$

**Answer:**



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6. Curie temperature is the temperature above which

A. a ferromagnetic material becomes paramagnetic

B. a paramagnetic material becomes diamagnetic

C. a ferromagnetic material becomes diamagnetic



D. a paramagnetic material becomes  
ferromagnetic

**Answer:**



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7. A watch glass containing some powdered substance is placed between the pole pieces of a magnet. Deep concavity is observed at the centre. The substance in the watch glass is

A. iron

B. chromium

C. carbon

D. wood

**Answer:**



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8. A coil in the shape of an equilateral triangle of side  $l$  is suspended between the pole pieces of a permanent magnet such that  $\vec{B}$  is in the

plane of the coil. If due to a current  $i$  in the triangle a torque  $\tau$  acts on it, the side  $l$  of the triangle is

A.  $\frac{2}{\sqrt{3}} \left( \frac{\tau}{B \cdot i} \right)^{\frac{1}{2}}$

B.  $2 \left( \frac{\tau}{\sqrt{3} B \cdot i} \right)^{\frac{1}{2}}$

C.  $\frac{2}{\sqrt{3}} \left( \frac{\tau}{B \cdot i} \right)$

D.  $\frac{1}{\sqrt{3}} \frac{\tau}{B \cdot i}$

**Answer:**



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9. A compass needle whose magnetic moment is  $60Am^2$ , is directed towards geographical north at any place experiencing moment of force of  $1.2x \times 10^{-3}$  Nm. At that place the horizontal component of earth field is 40 micro  $W/m^2$ . What is the value of dip angle at that place?

A.  $30^\circ$

B.  $60^\circ$

C.  $45^\circ$

D.  $15^\circ$

**Answer:**



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**10.** The material suitable for making electromagnets should have

- A. high retentivity and low coercivity
- B. low retentivity and low coercivity
- C. high retentivity and high coercivity
- D. low retentivity and high coercivity

**Answer:**



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**11.** The length of a magnet is large compared to its width and breadth. The time period of its oscillation in a vibration magnetometer is  $2s$ . The magnet is cut along its length into three equal parts and these parts are then placed on each other with their like poles together . The time period of this combination will be

A.  $2\sqrt{3}s$

B.  $\frac{2}{3}s$

C.  $2s$

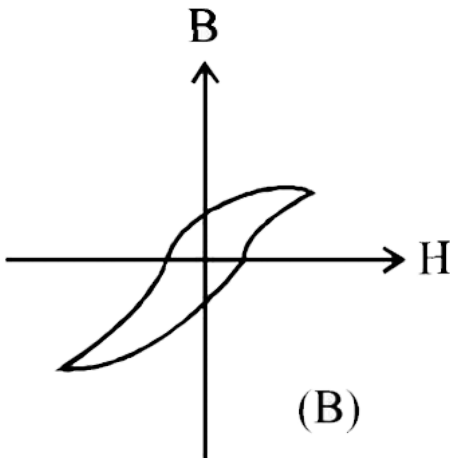
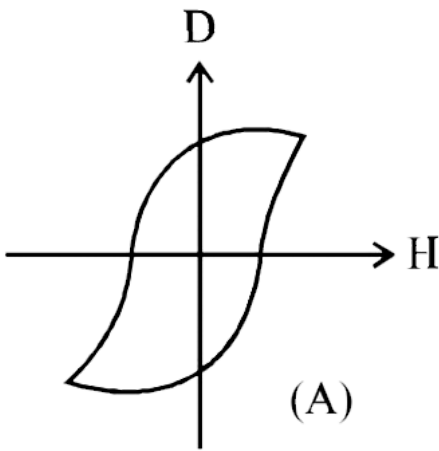
D.  $\frac{2}{\sqrt{3}}s$

**Answer:**



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**12.** Hysteresis loops for two magnetic materials  $A$  and  $B$  are given below :



These materials are used to make magnets for electric generators , transformer core and electromagnet core. Then it is proper to use :



A. A for transformers and B for electric generators.

B. B for electromagnets and transformers.

C. A for electric generators and transformers.

D. A for electromagnets and B for electric generators.

**Answer:**



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**13.** Which of the following is responsible for the earth's magnetic field ?

A. Convective currents in earth's core.

B. Divergent current in earth's core.

C. Rotational motion of earth

D. Translational motion of earth

**Answer:**



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14. In a vibration magnetometer, the time period of a bar magnet oscillating in horizontal component of earth's magnetic field is 2 sec. When a magnet is brought near and parallel to it, the time period reduces to 1 sec. The ratio  $H/F$  of the horizontal component  $H$  and the field  $F$  due to magnet will be

A. 3

B.  $1/3$

C.  $\sqrt{3}$

D.  $1/\sqrt{3}$

**Answer:**



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**15.** Let  $V$  and  $H$  be the vertical and horizontal components of earth's magnetic field at any point on earth. Near the north pole

A.  $V > H$

B.  $V < H$

C.  $V=H$

D.  $V=H=0$

**Answer:**



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**16.** A thin circular wire carrying a current  $I$  has a magnetic moment  $M$ . The shape of the wire is changed to a square and it carries the same current. It will have a magnetic moment

A.  $M$

B.  $\frac{4}{\pi^2} M$

C.  $\frac{4}{\pi} M$

D.  $\frac{\pi}{4}M$

**Answer:**



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**17.** A bar magnet of magnetic moment  $M$  is placed at right angles to a magnetic induction  $B$ . If a force  $F$  is experienced by each pole of the magnet, the length of the magnet will be

A.  $F / MB$

B.  $MB//F'$

C.  $BF / M$

D.  $MF//B'$

**Answer:**



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**18.** If the susceptibility of dia, para and ferro magnetic materials are  $\chi_d, \chi_p, \chi_f$  respectively, then

A.  $\chi_d < \chi_p < \chi_f$

B.  $\chi_d < \chi_f < \chi_p$

C.  $\chi_f < \chi_d < \chi_p$

D.  $\chi_f < \chi_p < \chi_d$

**Answer:**



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**19.** The basic magnetization curve for a ferromagnetic material is shown in figure. Then, the value of relative permeability is



highest for the point



A. P

B. Q

C. R

D. S

**Answer:**



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20. A magnetic needle suspended by a silk thread is vibrating in the earth's magnetic field. If the temperature of the needle is increased by  $500^{\circ}C$ , then

- A. time period decreases
- B. time period increases
- C. time period remains unchanged
- D. the needle stops vibrating

**Answer:**



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21. A bar magnet has a length of 8cm. The magnetic field at a point at a distance 3cm from the centre in the broadside-on position is found to be  $4 \times 10^{-6} T$ . Find the pole strength of the magnet.

A.  $6 \times 10^{-5} Am$

B.  $5 \times 10^{-5} Am$

C.  $2 \times 10^{-4} Am$

D.  $3 \times 10^{-4} Am$

**Answer:**



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**22.** A vibrations magnetometer consists of two identical bar magnet placed one over the other that they are perpendicular and bisect each other. The time period of oscillation in a horizontal magnetic field is  $2^{5/4}$  s. One of the magnets is removed and if the other magnet oscillates in the same field, then the time period in second is :

A.  $2^{1/4}$

B.  $2^{1/2}$

C. 2

D.  $2^{3/4}$

**Answer:**



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**23.** A magnetic needle is kept in a non uniform magnetic field . It experiences

A. neither a force nor a torque

B. a torque but not a force

C. a force but not a torque

D. a force and a torque

**Answer:**



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**24.** Needles  $N_1$ ,  $N_2$ , and  $N_3$  are made of a ferromagnetic, a paramagnetic and a

diamagnetic substance respectively . A magnet  
when brought close to them will

A. attract  $N_1$  and  $N_2$  strongly but repel

$N_3$

B. attract  $N_1$  strongly,  $N_2$  weakly and repel

$N_3$  weakly

C. attract  $N_1$  strongly, but repel

$N_2$  and  $N_3$  weakly

D. attract all three of them

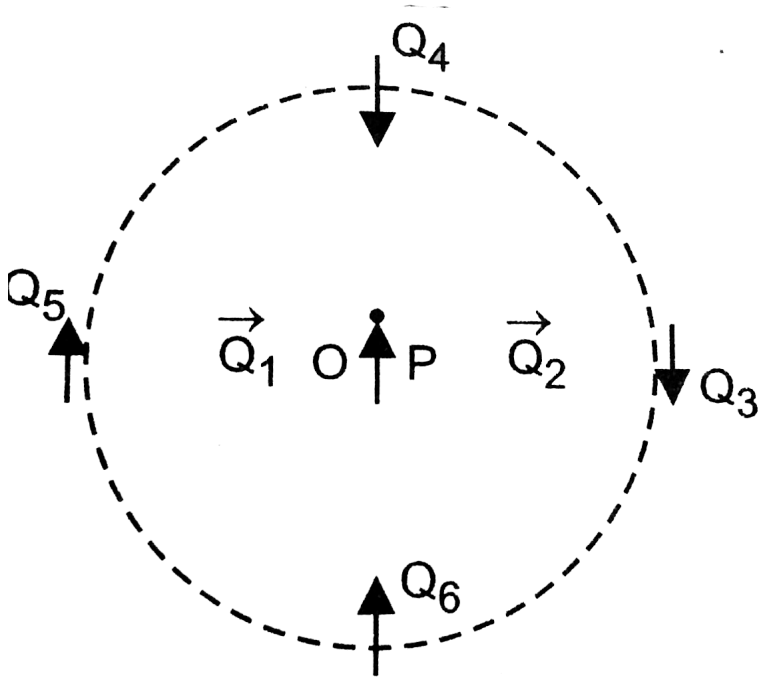
**Answer:**



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**25.** Figure shows a small magnetised needle P placed at a point O. The arrow shows the direction of magnetic moment. The other arrows show different positions (and orientations of the magnetic moment) of another identical magnetised needle Q.





- (a) In which configuration is the system not in equilibrium?
- (b) In which configuration is the system in (i) stable and (ii) unstable equilibrium?
- (c) Which configuration corresponds to the

lowest potential energy among all the configurations shown?

A.  $PQ_3$

B.  $PQ_4$

C.  $PQ_5$

D.  $PQ_6$

**Answer:**



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26. A dip needle lies initially in the magnetic meridian when it shows an angle of dip  $\theta$  at a place. The dip circle is rotated through an angle  $x$  in the horizontal plane and then it shows an angle of dip  $\theta'$ . Then  $\frac{\tan \theta'}{\tan \theta}$  is

A.  $\frac{1}{\cos x}$

B.  $\frac{1}{\sin x}$

C.  $\frac{1}{\tan x}$

D.  $\cos x$

**Answer:**



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27. Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of  $60^\circ$  and  $45^\circ$  respectively. The ratio of the number of turns in the coils is

A.  $4/3$

B.  $\frac{\sqrt{3} + 1}{1}$

C.  $\frac{\sqrt{3} + 1}{\sqrt{3} - 1}$

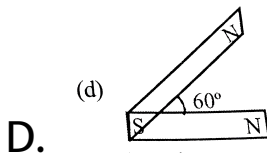
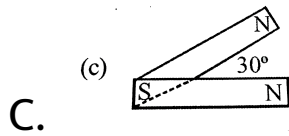
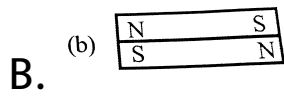
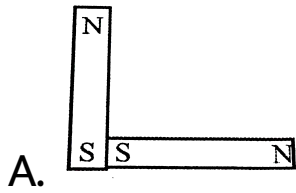
D.  $\frac{\sqrt{3}}{1}$

**Answer:**



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**28.** Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment ( $m$ ). Which configuration has highest value of magnetic dipole moment?



**Answer:**



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29. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It

A. will become rigid showing no movement

B. will stay in any position

C. will stay in north-south direction only

D. will stay in east-west direction only

**Answer:**



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30. If a magnetic dipole of moment  $M$  situated in the direction of a magnetic field  $B$  is rotated by  $180^\circ$ , then the amount of work done is

A.  $MB$

B.  $2MB$

C.  $\frac{MB}{\sqrt{2}}$

D. 0

**Answer:**



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**31.** A bar magnet is oscillating in the earth's magnetic field with a period  $T$ . What happens to its period and motion if its mass is quadrupled

A. motion remains simple harmonic with

new period =  $T/2$

B. motion remains simple harmonic with

new period =  $2T$

C. motion remains simple harmonic with

new period =  $4T$

D. motion remains simple harmonic and  
the period stays nearly constant

**Answer:**



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**32.** The magnetic field of earth at the equator  
is approximately  
 $4 \times 10^{-5} T$ . The radius of earth is  $6.4 \times 10^6$  m. Then the dipole moment of the  
earth will be nearly of the order of:

A.  $10^{23} \text{ Am}^2$

B.  $10^{20} \text{ Am}^2$

C.  $10^{16} \text{ Am}^2$

D.  $10^{10} \text{ Am}^2$

**Answer:**



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**33.** The relative permeability of a medium is 0.075. What is its magnetic susceptibility?

A. 0.925

B.  $-0.925$

C. 1.075

D.  $-1.075$

**Answer:**



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**34.** A dip circle is adjusted so that its needle moves freely in the magnetic meridian. In this position, the angle of dip is  $40^\circ$ . Now the dip

circle is rotated so that the plane in which the needle moves makes an angle of  $30^\circ$  with the magnetic meridian. In this position the needle will dip by an angle

A.  $40^\circ$

B.  $30^\circ$

C. more than  $40^\circ$

D. less than  $40^\circ$

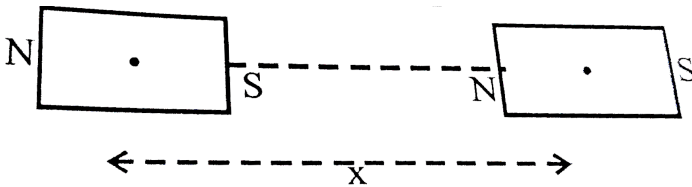
**Answer:**



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35. The mid points of two small magnetic dipoles of length  $d$  in end-on positions, are separated by a distance  $x$ , ( $x \gg d$ ). The force between them is proportional to  $x^{-n}$

where  $n$  is:



A. 1

B. 2

C. 3

D. 4

**Answer:**



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**36.** At a temperature of  $30^{\circ}C$ , the susceptibility of ferromagnetic material is found to be ' $\chi$ ' its susceptibility at  $333^{\circ}C$  is

A.  $\chi$

B.  $0.5\chi$

C.  $2\chi$

D.  $11.1\chi$

**Answer:**



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**37.** The susceptibility of annealed iron at saturation is 5500. Find the permeability of annealed iron at saturation.

A.  $6.9 \times 10^{-3}$



B.  $5.1 \times 10^{-2}$

C.  $5 \times 10^2$

D.  $3.2 \times 10^{-5}$

**Answer:**



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**38.** A short magnet oscillates in an oscillation magnetometer with a time period of 0.10s where the earth's horizontal magnetic field is  $24\mu T$ . A downward current of 18A is

established in a vertical wire placed 20cm east of the magnet. Find the new time period.

A. 0.076s

B. 0.5s

C. 0.1s

D. 0.2s

**Answer:**



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**39.** A permanent magnet in the shape of a thin cylinder of length  $10\text{cm}$  has  $M = 10^6\text{ A/m}$ . Calculate the magnetisation current  $I_M$ . (Here  $M$  is the intensity of magnetisation).

A.  $10^5\text{ A}$

B.  $10^6\text{ A}$

C.  $10^7\text{ A}$

D.  $10^8\text{ A}$

**Answer:**



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40. The earth's magnetic field lines resemble that of a dipole at the centre of the earth. If the magnetic moment of this dipole is close to  $8x \times 10^{22} Am^2$ , the value of earth's magnetic field near the equator is close to (radius of the earth =  $6.4 \times 10^6 m$ )

A. 0.6 Gauss

B. 1.2 Gauss

C. 1.8 Gauss

D. 0.32 Gauss

**Answer:**



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**41.** The coercivity of a small magnet where the ferromagnet gets demagnetized is  $3 \times 10^3 \text{ Am}^{-1}$ . The current required to be passed in a solenoid of length  $10\text{cm}$  and number of turns 100, so that the magnet gets demagnetized when inside the solenoid, is :

A. 30mA

B. 60mA

C. 3A

D. 6A

**Answer:**



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**42.** A thin bar magnet of length  $2l$  and breadth  $2b$  pole strength  $m$  and magnetic moment  $M$  is divided into four equal parts

with length and breadth of each part being half of original magnet.

Then, the magnetic moment of each part is

A.  $M / 4$

B.  $M$

C.  $M / 2$

D.  $2 M$

**Answer:**



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