



PHYSICS

BOOKS - MTG IIT JEE FOUNDATION

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Illustrations

1. The diagram shows three bars placed in line.

X and Y are both magnets, Z is soft iron.



What are the magnetic forces on X and Z due to magnet Y?



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2. Look at the picture given below and identify the object A, B and C.



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3. Beena wanted to make an electromagnet. She first took a pencil and wrapped a coil around it and connected the coil to a cell. Then she repeated the same experiment with a steel screw. In which case will she be successful and why?



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4. AB is a current carrying conductor in the plane of the paper as shown in figure. What

are the directions of magnetic fields produced by it at points P and Q? Given $r_1 > r_2$, where will the strength of the magnetic field be larger?



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Solved Examples

1. Identify magnetic and non-magnetic substance from the list given below: Iron,

Steel, Nickel, Plastic, Wood, Copper and a stainless steel spoon.



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2. What are magnetic materials? List the properties of a magnet.



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3. Few iron nails and screws got mixed with the wooden shavings while a carpenter was

working with them. How can you help him in getting the nails and screws back from the scrap without wasting his time in searching with his hands.



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4. It is said that repulsion is a sure test for magnetism. Why is it so?



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5. Show that a magnet has two poles. What are the properties of the poles of a magnet?



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6. The magnetic field in a given region is uniform. Draw a diagram to represent it.



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7. State Fleming's left-hand rule.



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8. What is magnetic field? Give important properties of magnetic field lines.



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9. What important observation did Oersted make in his experiment with current-carrying conductors?



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10. What is the form of magnetic field lines due to a straight current-carrying conductor?



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Exercise Multiple Choice Questions

1. How many number of poles of magnet are there?

A. one

B. two

C. three

D. four

Answer: B



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2. Like poles

A. repel each other

B. attract each other

C. sometime repel and sometime attract

D. produce no effect at all

Answer: A



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3. Unlike poles

A. repel each other

B. attract each other

C. sometime repel and sometime attract

D. produce no effect at all

Answer: B



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4. A magnet is also called lodestone because

A. it lifts load

B. it is a stone

C. it tells us direction

D. none of these

Answer: C



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5. Non-magnetic materials are

- A. Plastic, wood, iron and paper
- B. Iron, nickle and cobalt
- C. Leather, iron, nickle and clothes
- D. Plastic, leather, clothes and paper

Answer: D



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6. Which of the following is not a magnetic material?

A. gold

B. nickel

C. iron

D. cobalt

Answer: A



7. The magnetic strength of a magnet

A. is uniform throughout the body of the magnet

B. is concentrated at one point called the pole of the magnet

C. is concentrated at the two ends of the magnets called the poles of the magnet.

D. is concentrated in the centre of the magnet.

Answer: C



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8. Which of these does not use a magnet?

A. LCD TV

B. electric fan

C. computer hard disk

D. DVD

Answer: D



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9. A freely suspended magnet comes to rest in the ____ direction.

A. north-south direction.

B. north-east direction.

C. north-west direction.

D. east-west direction.

Answer: A



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10. Which of the following cannot happen, irrespective of whether the given iron bar B is a bar magnet or not?

A. Both ends B are attracted to the north pole of a magnet.

B. Both ends B are attracted to the south pole of a magnet.

C. One ends B are attracted and the other end is repelled by the north pole of a magnet.

D. Both ends of B are repelled by the south pole of magnet.

Answer: D



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11. An example of a natural magnet is.

A. bar magnet

B. horse-shoe magnet

C. lodestone

D. electromagnets

Answer: C



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12. A rectangular piece is brought near the north pole of a magnet. It gets attracted to the magnet. Then it is brought near the south pole of the magnet. Again it gets attracted to the magnet. The rectangular piece is.

A. a magnet and the end which is brought near the magnet is the south pole.

B. a magnet and the end which is brought near the magnet is the north pole.

C. not a magnet but a simple piece of magnetic material.

D. not a magnet but a simple piece of non magnetic material.

Answer: C



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13. If the magnet is heated strongly on the flame.

- A. its magnetic effect will increase
- B. its magnetic effect will be destroyed
- C. there will be no effect
- D. anything can happen

Answer: B



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14. Which of the following is not correct about the magnetic field lines?

A. Magnetic field lines are closer at the poles.

B. Magnetic field lines are directed from south pole to north pole outside the magnet

C. Magnetic field lines do not intersect each other.

D. Magnetic field lines are directed from south pole to north pole inside the magnet.

Answer: B



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15. The property of attracting small pieces of iron by a substance is referred as

- A. magnetism
- B. electromagnetism
- C. deflection
- D. none of these

Answer: A



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16. A magnetic field cannot exert any force on

a

A. moving charge

B. moving magnet

C. stationary magnet

D. stationary charge

Answer: D



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17. For making an electromagnet the best material to be used is

A. stainless steel

B. silver

C. soft iron

D. nickel

Answer: C



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18. Choose the wrong statement

A. Magnetic poles always exist in pairs

B. Magnetic poles are always of equal strength

C. Like poles repel each other

D. Unlike poles repel each other

Answer: D



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19. Magnetic lines of force

A. have directions

B. have no physical reality

C. can be used to indicate the direction of
the magnetic field at a point

D. all of the above are correct.

Answer: D



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20. Which of the following figures represents the magnetic lines of force due to an isolated north pole?



Answer: A



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21. Which of the following figures represents the magnetic lines of force due to an isolated south pole ?



Answer: A



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22. Magnetic field lines are closer where the magnetic field is

A. strong

B. weak

C. sometimes strong and sometimes weak

D. none of these

Answer: A



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23. A uniform magnetic field is represented by

- A. parallel and equidistant field lines
- B. non parallel but equidistant field lines
- C. perpendicular lines
- D. curved lines

Answer: A



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24. Magnetic needle is in the form of elongated

A. rhombus

B. square

C. triangle

D. rectangle

Answer: A



25. Space around a magnet in which the force of attraction and repulsion due to the magnet can be detected is called

A. electric field

B. magnetic field

C. magnetic force

D. both ends of B are repelled by the south pole of magnet.

Answer: B



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26. A natural magnet is also called a

A. magnetite

B. lodestone

C. poles

D. electromagnet

Answer: B



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27. In case of a solenoid, the strength of magnetic field depends upon

A. current in the coil only

B. number of turns per unit length of solenoid

C. both (a) and (b)

D. none of these

Answer: C



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28. The direction of magnetic field around a current carrying conductor is given by

- A. Fleming's left hand rule
- B. Right hand thumb rule
- C. Both (a) and (b)
- D. None of these

Answer: B



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29. Magnetic field produced by a solenoid and a bar magnet

A. similar

B. different

C. sometimes similar and sometimes different

D. none of these

Answer: A



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30. The direction of force (motion) of a current carrying conductor in a magnetic field is given by

A. Fleming's left hand rule

B. Right hand thumb rule

C. Fleming's right hand rule

D. None of these.

Answer: A



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31. A magnetic field exerts no force on

A. an electric charge moving perpendicular
to its direction

B. an unmagnetised iron bar

C. a stationary electric charge

D. a magnet

Answer: C



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32. What is a solenoid? Draw magnetic field lines due to a current carrying solenoid.

A. parabolic

B. curved

C. straight

D. circular

Answer: C



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33. A soft iron bar is inserted inside a current-carrying solenoid. The magnetic field inside the solenoid :

A. will become zero

B. will decrease

C. will increase

D. will remain unaffected.

Answer: C



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34. A magnetic needle is used to find

A. the magnetic north-south direction

B. the direction of magnetic field at a place

C. to test the polarity of a magnet

D. all of these

Answer: D



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35. An electric current predominantly produces field around it.

A. magnetic

B. electric

C. gravitational

D. all the above

Answer: A



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36. Magnetite is a/an

A. natural magnet

B. electromagnet

C. U-shaped magnet

D. none of these

Answer: A



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37. By increasing the number of turns in the coil, the strength of the magnetic field.

A. decreases

B. increases

C. first decreases then increases

D. remains unchanged

Answer: B



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38. Choose the correct statement.

A. Lines of force are not imaginary lines.

B. Lines of force cannot be mapped on
paper.

C. Lines of force do not intersect each other

D. Lines of force always intersect each other.

Answer: D



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39. If current in the core decreases, the strength of the magnetic field

A. decreases

B. increases

C. sometimes decreases and sometimes
increases

D. remains unchanged

Answer: A



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40. The fact that current is associated with a magnetic field was first discovered by which of the following scientists ?

A. Oersted

B. Maxwell

C. Faraday

D. Ohm

Answer: A



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41. An electromagnet is a magnet whose magnetism arises due to

A. Flow of electric current

B. Movement of magnet

C. nature of material

D. none of these

Answer: A



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42. A compass needle just above a wire in which electrons are moving towards east, will point

A. east

B. west

C. north

D. south

Answer: C



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43. The magnetic field lines around a bar magnet can be traced with the help of

- A. iron filings
- B. tracing compass
- C. both (a) and (b)
- D. none of the above.

Answer: C



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44. When a charged particle moves through a magnetic field it suffers a change in its

A. energy

B. mass

C. speed

D. direction of motion

Answer: D



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45. A straight wire is carrying an electric current

A. there are no magnetic lines of force near the wire

B. there are lines of force and they are circular lines encircling the wire

C. the lines of force are straight lines parallel to the wire and in the direction opposite to the current

D. the lines of force are straight lines parallel to the wire in the direction opposite to the current.

Answer: B



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Exercise Match The Following

1. 

A. P-4,Q-1,R-5,S-2,T-3

B. P-1,Q-2,R-5,S-3,T-3

C. P-5,Q-1,R-4,S-2,T-3

D. P-1,Q-2,R-4,S-5,T-3

Answer: A



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2. Kabir floats a small boat in water . He brings a magnet near the boat. Match the followig .



A. P-2,Q-3,R-1,S-4

B. P-3,Q-4,R-1,S-2

C. P-3,Q-2,1,R-1,S-4

D. P-3,Q-4,R-3,S-3,4

Answer: C



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Exercise Assertion Reason Type

1. Assertion : We cannot make a magnet with only one pole.

Reason : Magnetic monopoles do not exist.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A



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2. Assertion : Substances which get attracted towards magnets are called magnetic materials.

Reason : Wood is not attracted to a magnet.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B



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3. Assertion : The magnetic strength of a magnet is uniform throughout the body of the magnet.

Reason : The regions of strong magnetism in a magnet are called poles of a magnet.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: D



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4. Assertion : The magnet tend to become weaker if left free for sometime.

Reason The magnets should be kept in magnetic keepers.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A



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5. Assertion : If a magnet is rolled in a packet of steel pins, the pins will get most attracted to the poles of a magnet.

Reason : Poles always exist in pairs.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B



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6. Assertion : The single touch method of making a magnet is extensively used nowadays to make magnets.

Reason : The magnetisation of magnetic materials is also done by electric currents.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: D



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7. Assertion : The region around a magnet where its magnetic influence can be felt is called magnetic field.

Reason : If a magnet is heated, it can lose its magnetism.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B



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8. Assertion : A compass is an instrument used to find directions.

Reason : A compass needle always points in north south direction.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: A



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9. Assertion : Artificial magnets are also known as permanent magnets since their magnetism persists for long time.

Reason : In hospitals, strong magnets are used to remove iron or steel splinters from patients eye or other parts of the body.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: B



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10. Assertion : The magnetic effects of magnet can pass through the screens of substances such as plastic, paper, glass etc.

Reason : A magnet when brought near a plastic ruler, it attracts the plastic ruler towards it.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: C



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Exercise Comprehension Type Passage I

1. Three specimens of magnetic material were tested using the apparatus shown in the diagram.



Iron nails When the switch is closed, the specimen picks up some of the iron nails but when the switch is opened, many or most of the nails fall off. The number of nails picked up and left on were found on three specimens. The table shows the results.



Which material is the best electromagnet among the three?

A. X

B. Y

C. Z

D. all the above

Answer: C



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2. Three specimens of magnetic material were tested using the apparatus shown in the diagram.



Iron nails When the switch is closed, the specimen picks up some of the iron nails but when the switch is opened, many or most of the nails fall off. The number of nails picked up and left on were found on three specimens. The table shows the results.



If the solenoid XY is free to move , it would .

A. X

B. Y

C. Z

D. all the above

Answer: B



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Exercise Comprehension Type Passage Ii

1. The figure shows two solenoids XY and PQ arranged coaxially close to each other.



When the switch S is closed, the magnetic poles produced at the end P and the end X of the solenoids are

- A. P X
N-pole S-pole
- B. P X
S-pole N-pole
- C. P X
S-pole S-pole
- D. P X
N-pole N-pole

Answer: D



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2. The figure shows two solenoids XY and PQ arranged coaxially close to each other.



If the solenoid XY is free to move, it would .

- A. move towards solenoid PQ
- B. move away from solenoid PQ
- C. rotate in the clockwise direction

D. rotate in the anti-clockwise direction

Answer: B



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Exercise Integer Numerical Value Type

1. Magnetic field due to a current carrying conductor at a point is, $B = \frac{KI}{r}$, where I is the current through the conductor and r is the distance of a point from the conductor. At

20 cm from the conductor for the 10 A current, magnetic field is 50 tesla. Keeping the distance same, what is the value of magnetic field in tesla) for 40 A current ? (K is the constant of proportionality).



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2. Magnetic field due to a current carrying conductor at a point is, $B = \frac{KI}{r}$, where I is the current through the conductor and r is the distance of a point from the conductor. At

40 cm from the conductor for 15 A current, magnetic field is 60 tesla. Keeping the current same, what is the value of magnetic field (in tesla) at a distance of 20 cm ? (K is the constant of proportionality).



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3. Magnetic field near centre of long solenoid for a fixed number of turns is given by, $B = KI$, where K is the constant of proportionality. For 1.5 A current, the amount of magnetic field is

12 tesla, what is the value of magnetic field for the same number of turns at same point for 3 A current ?



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