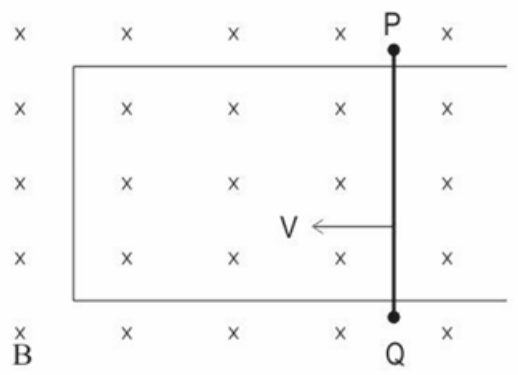
INDIAN SCHOOL NIZWA - WORKSHEET

PHYSICS

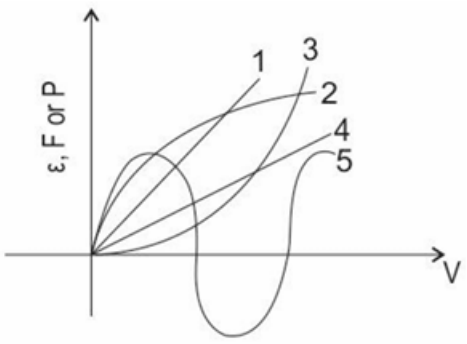
CH: 6 ELECTROMAGNETIC INDUCTION

Name: _____ Date:_____ Class:XII Sec: A___

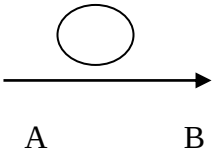
I	MCQs
1.	A conducting rod PQ of a small resistance is moved at a constant velocity v under the effect of a constant force F through a region of the constant magnetic field as shown. Assume no energy losses.

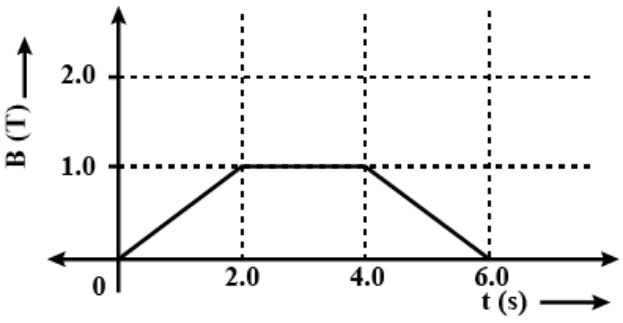


If the emf induced across PQ is ε and a force F and power P is used to move the rod, then which of the following graphs correctly represent ε, F, and P as a function of speed v respectively?



A. Graphs 5, 3 and 1
B. Graphs 2, 4 and 5
C. Graphs 4, 1 and 3
D. Graphs 3, 2 and 4

2.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false and Reason (R) is also false. *Assertion (A) :* The mutual inductance between two coils is maximum when the coils are wound on each other. *Reason (R) :* The flux linkage between two coils is maximum when they are wound on each other.
1. Ans	The magnitude of electric current is increasing from A to B. If there is any induced current in the loop , what will be its direction?  The current in the loop will be clockwise. According to right hand thumb rule , magnetic field passing through the loop due to current in AB is perpendicular to the plane of paper and outwards. The direction of induced current in the loop must be clockwise so as to oppose the increase in this filed.
2. Ans.	The coil is removed from a magnetic field (i) rapidly (ii) slowly. In which case , more work will be done? The work done will be more when the coil is removed rapidly. This is because in that case , opposing emf induced in the coil will be more.
3. Ans.	A bar magnet falls through a metal ring. Will its acceleration be equal to g ? No, the acceleration will be less than g. This is because as the magnet falls the magnetic flux linked with the ring changes. An induced current is developed in the ring which opposes the downward motion of the magnet. After the magnet has crossed the metal ring , amount of magnetic flux liked with the ring goes on decreasing. An induced current develops in the ring and opposes the fall of the fall of the magnet. Therefore the downward acceleration of the magnet continues to be less than g.
4.	How is mutual inductance of a pair of coils affected when, (i) separation between the coils is increased, (ii) the number of turns of each coil is increased, (iii) a thin sheet is placed between the two coils, other factors remaining the same? Explain your answer in each case.

5.	An ideal inductor when connected in ac circuit does not produce heating effect though it reduces the current in the circuit. Explain why?
6.	A cylindrical bar magnet is kept along the axis of a circular coil. Will there be a current induced in the coil if the magnet is rotated about its axis? Give reasons.
ii	NUMERICALS
7.	Find the change in current in an inductor of 10H in which the emf induced is 300V in 10^{-2}sec. Also find the change in magnetic flux.
8.	Magnetic flux of 5 microweber is linked with a coil when a current of 1mA flows through it. What is the self-inductance of the coil?
9.	A jet plane is travelling west at 450m/s. If the horizontal component of earth's magnetic field at that place is 4×10^{-4}T and the angle of dip is 30^0. Find the emf induced between the ends of wings having a span of 30m.
10.	If the self-induction of an air core solenoid increases from 0.01mH to 16mH on introducing an iron core into it, what is relative magnetic permeability?
11.	What is the magnetic flux through each turn of a solenoid of self-inductance 8×10^{-5}H, when a current of 3A flows through it? Assume that the solenoid has 1000 turns and is wound from wire of diameter 1mm. What is the cross-sectional area of the solenoid?
12.	A conducting circular loop is placed in a uniform magnetic field, B = 0.020T with its plane perpendicular to the field. Somehow, the radius of the loop starts shrinking at a constant rate of 1mm/s. Find the induced emf in the loop at an instant when the radius is 2cm?
13.	Two circular coils, one of small radius r_1 and the other of very large radius r_2, are placed co axially with centres coinciding. Obtain the mutual inductance of the arrangement.
14.	What is the self-inductance of a solenoid of length 40cm, area of cross section 20 cm^2 and total number of turns = 800?
15.	A metallic wire bent in the form of a semi circle of radius 0.1m is moved in a direction parallel to its plane, but perpendicular to a magnetic field, B = 20mT with a velocity of 10m/s. Find the emf induced in the wire.
16.	The magnetic field through a circular loop of wire 12 cm in radius and 8.5 ohm resistance changes with time as shown in the figure. The magnetic field is perpendicular to the plane of the loop. Calculate the induced current in the loop and plot it as a function of time. 

17.	Figure shows an inductor l and a resistor R connected in parallel to a battery through a switch. The resistance R is the same as that of the coil that makes L. Two identical bulbs are put in each arm of the circuit. (i) Which of the bulbs lights up bright when S is closed? (ii) Will the two bulbs be equally bright after some time? Give reason for your answer.
18.	A coil of wire of certain radius has 600 turns and a self-inductance of 108mH. What will be the self-inductance of another similar coil with 500 turns?
19.	What is the self - inductance of a solenoid of length 40cm, area of cross section 20 cm^2 and total number of turns 800?
20.	The mutual inductance of two coaxial coils is 2H. The current in one coil is changed uniformly form zero to 0.5A in 100ms. Find: (i) Change in the magnetic flux through the other coil (ii) Emf induced in the other coil during the change.