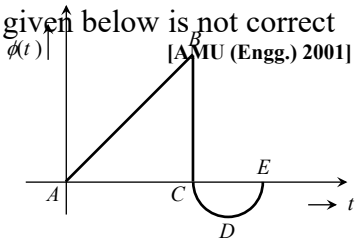
Graphical Questions

1. The graph Shows the variation in magnetic flux $\phi(t)$ with time through a coil. Which of the statements given below is not correct **[AMU (Engg.) 2001]**



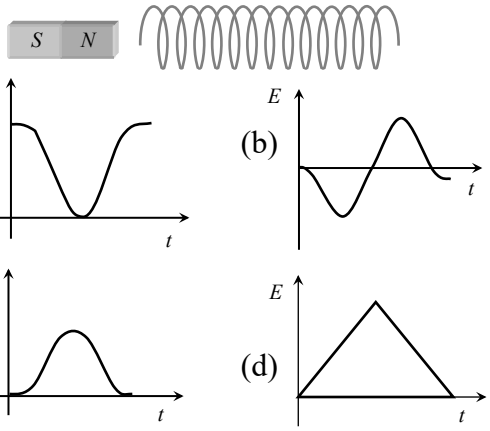
(a) There is a change in the direction as well as magnitude of the induced emf between B and D

(b) The magnitude of the induced emf is maximum between B and C

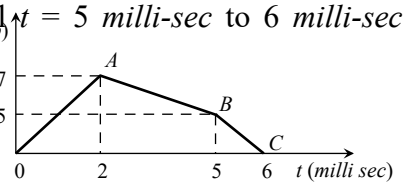
(b) There is a change in the direction as well as magnitude of induced emf between A and C

(d) The induced emf is zero at B

2. The variation of induced emf (E) with time (t) in a coil if a short bar magnet is moved along its axis with a constant velocity is best represented as **[IIT-JEE (Screening) 2004]**



3. The current through a 4.6 H inductor is shown in the following graph. The induced emf during the time interval t = 5 *milli-sec* to 6 *milli-sec* will be



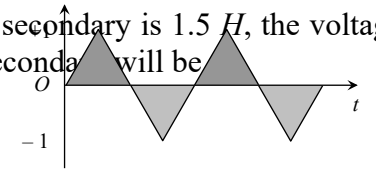
(a) 10^3 V

(b) -23×10^3 V

(c) 23×10^3 V

(d) Zero

4. An alternating current of frequency 200 *rad/sec* and peak value 1A as shown in the figure, is applied to the primary of a transformer. If the coefficient of mutual induction between the primary and the secondary is 1.5 H, the voltage induced in the secondary will be



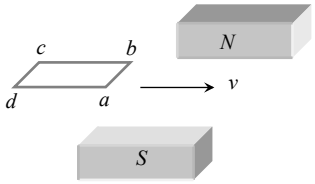
(a) 300 V

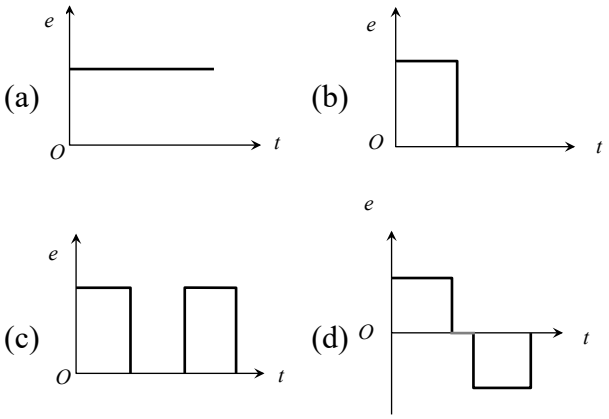
(b) 191 V

(c) 220 V

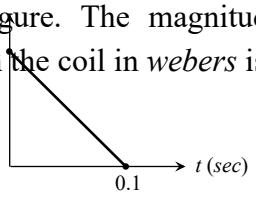
(d) 471 V

5. A horizontal loop *abcd* is moved across the pole pieces of a magnet as shown in fig. with a constant speed v. When the edge *ab* of the loop enters the pole pieces at time t = 0 *sec.* Which one of the following graphs represents correctly the induced emf in the coil





6. Some magnetic flux is changed from a coil of resistance 10 *ohm*. As a result an induced current is developed in it, which varies with time as shown in figure. The magnitude of change in flux through the coil in *webers* is



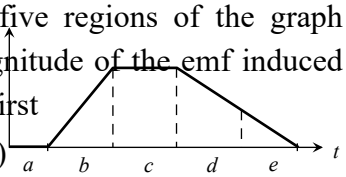
(a) 2

(b) 4

(c) 6

(d) None of these

7. The graph gives the magnitude $B(t)$ of a uniform magnetic field that exists throughout a conducting loop, perpendicular to the plane of the loop. Rank the five regions of the graph according to the magnitude of the emf induced in the loop, greatest first



(a) $b > (d = e) < (a = c)$

(b) $b > (d = e) > (a = c)$

(c) $b < d < e < c < a$

(d) $b > (a = c) > (d = e)$

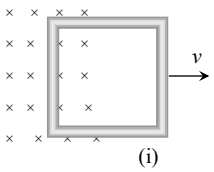
8. Figure (i) shows a conducting loop being pulled out of a magnetic field with a speed v. Which of the four plots shown in figure (ii) may represent the power delivered by the pulling agent as a function of the speed v

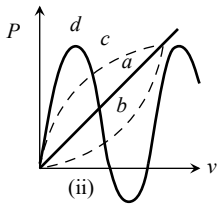
(a) a

(b) b

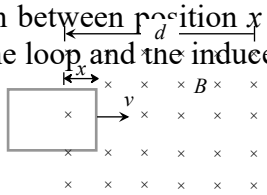
(c) c

(d) d

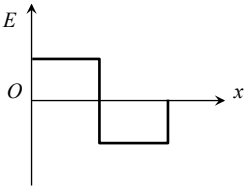




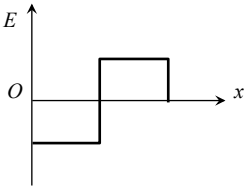
9. A rectangular loop is being pulled at a constant speed v, through a region of certain thickness d, in which a uniform magnetic field B is set up. The graph between position x of the right hand edge of the loop and the induced emf E will be



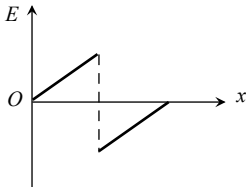
(a)



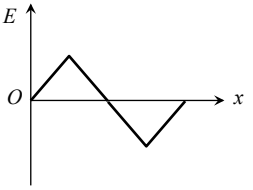
(b)



(c)

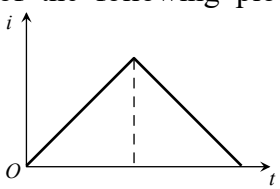


(d)

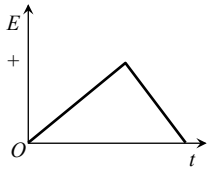


10. The current i in an inductance coil varies with time, t according to the graph shown in fig. Which one of the following plots shows the variation of voltage in the coil with time

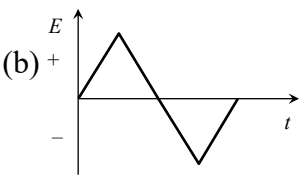
[CBSE PMT 1994]



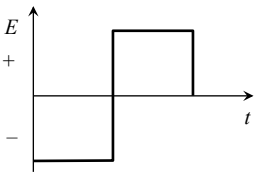
(a)



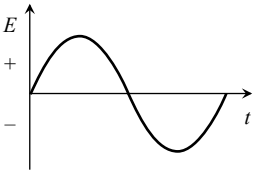
(b)



(c)

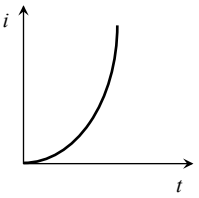


(d)

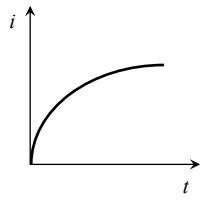


11. When a battery is connected across a series combination of self inductance L and resistance R, the variation in the current i with time t is best represented by **[MP PET 2004]**

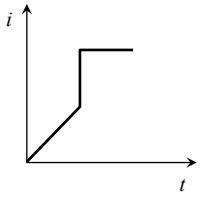
(a)



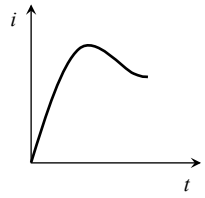
(b)



(c)



(d)



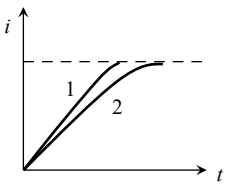
12. When a certain circuit consisting of a constant e.m.f. E an inductance L and a resistance R is closed, the current in, it increases with time according to curve 1. After one parameter (E, L or R) is changed, the increase in current follows curve 2 when the circuit is closed second time. Which parameter was changed and in what direction

(a) L is increased

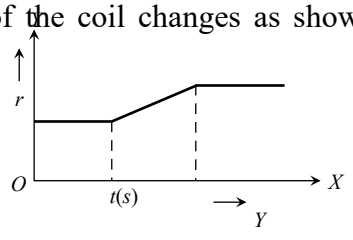
(b) L is decreased

(c) R is increased

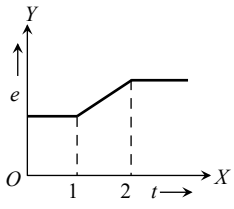
(d) R is decreased

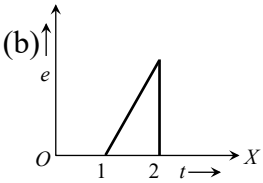


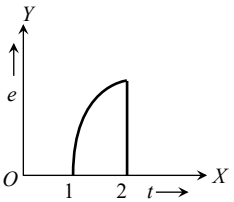
13. A flexible wire bent in the form of a circle is placed in a uniform magnetic field perpendicular to the plane of the coil. The radius of the coil changes as shown in figure.

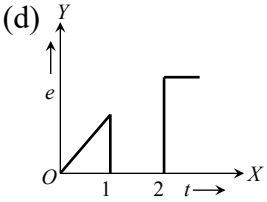


The graph of induced emf in the coil is represented by

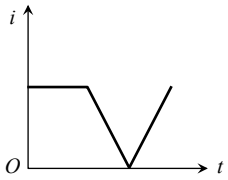
(a) 

(b) 

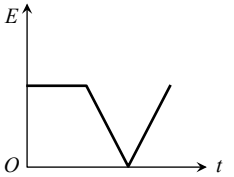
(c) 

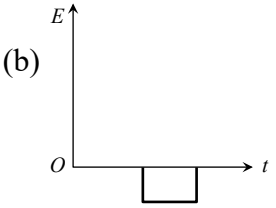
(d) 

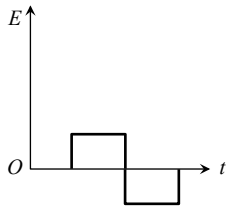
14. The current i in an induction coil varies with time t according to the graph shown

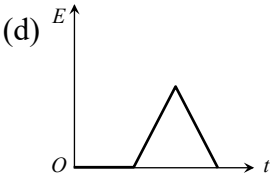


in figure. Which of the following graphs shows the induced emf *(e)* in the coil with time

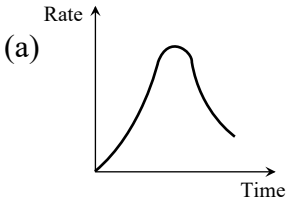
(a) 

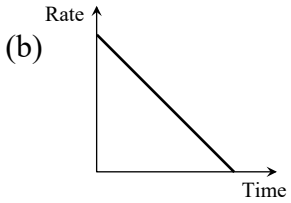
(b) 

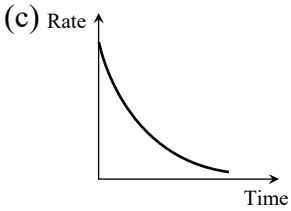
(c) 

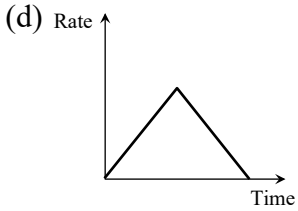
(d) 

15. In an L–R circuit connected to a battery the rate at which energy is stored in the inductor is plotted against time during the growth of the current in the circuit. Which of the following best represents the resulting curve

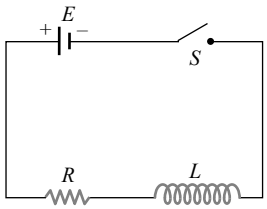
(a) 

(b) 

(c) 

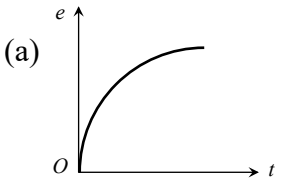
(d) 

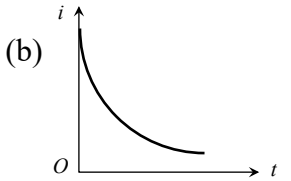
16. Switch S of the circuit shown in figure. is closed at $t = 0$. If e denotes the induced

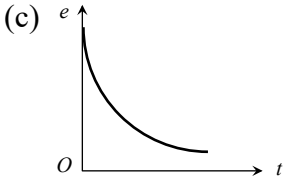


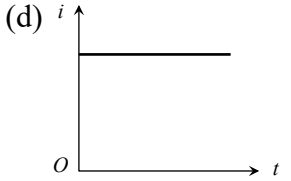
emf in L and i, the current flowing through the circuit at time

t, which of the following graphs is correct

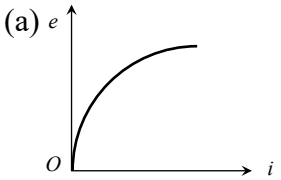
(a) 

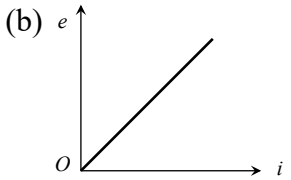
(b) 

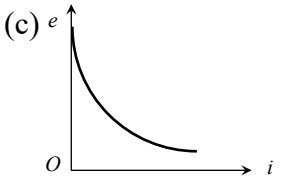
(c) 

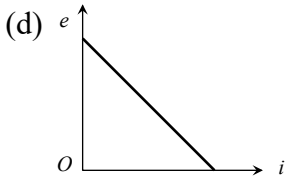
(d) 

17. For previous objective, which of the following graphs is correct

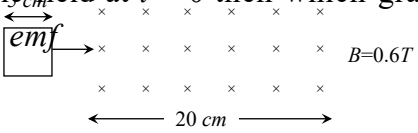
(a) 

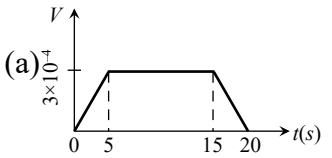
(b) 

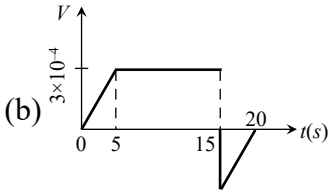
(c) 

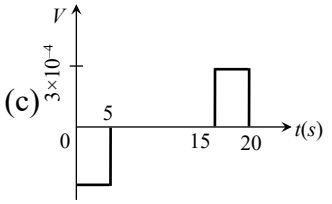
(d) 

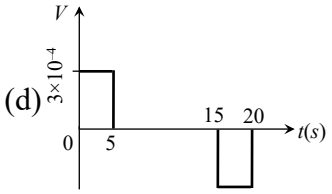
18. A square loop of side 5 *cm* enters a magnetic field with 1 cms^{-1}. The front edge enters the magnetic field at $t = 0$ then which graph best depicts *emf*



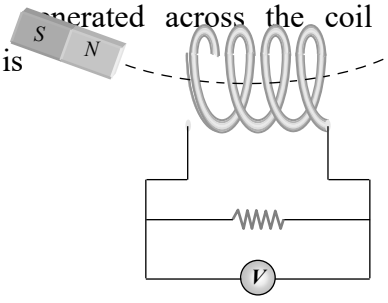




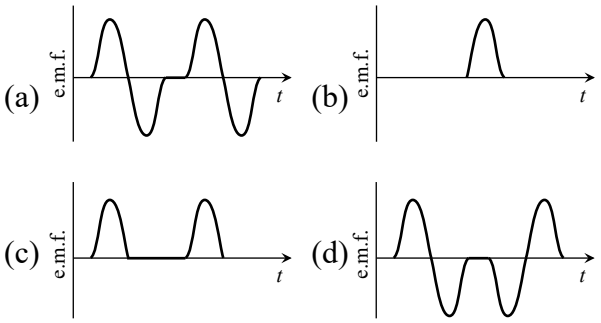




19. A magnet is made to oscillate with a particular frequency, passing through a coil as shown in figure. The time variation of the magnitude of e.m.f. generated across the coil during one cycle is **[AIIMS 2005]**



V.



A R Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below:

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Eddy currents is produced in any metallic conductor when magnetic flux is changed around it.
Reason : Electric potential determines the flow of charge. **[AIIMS 1995]**

2. Assertion : The quantity L/R possesses dimensions of time.
Reason : To reduce the rate of increases of current through a solenoid should increase the time constant (L/R). **[AIIMS 2002]**

3. Assertion : Faraday's laws are consequences of conservation of energy.
Reason : In a purely resistive ac circuit, the current lags behind the e.m.f. in phase. **[AIIMS 2002]**

4. Assertion : Only a change in magnetic flux will maintain an induced current the coil.
Reason : The presence of large magnetic flux through a coil maintains a current in the coil if the circuit is continuous. **[AIIMS 1999]**

5. Assertion : Magnetic flux can produce induced e.m.f.
Reason : Faraday established induced e.m.f. experimentally.

6. Assertion : The induced e.m.f. and current will be same in two identical loops of copper and aluminium, when rotated with same speed in the same magnetic field.
Reason : Induced e.m.f. is proportional to rate of change of magnetic field while induced current depends on resistance of wire.

7. Assertion : Inductance coil are made of copper.
Reason : Induced current is more in wire having less resistance.

8. Assertion : Self-inductance is called the inertia of electricity.
Reason : Self-inductance is the phenomenon, according to which an opposing induced e.m.f. is produced in a coil as a result of change in current or magnetic flux linked in the coil.

9. Assertion : When two coils are wound on each other, the mutual induction between the coils is maximum.
Reason : Mutual induction does not depend on the orientation of the coils.

10. Assertion : Acceleration of a magnet falling through a long solenoid decreases.
Reason : The induced current produced in a circuit always flow in such direction that it opposes the change or the cause the produced it.

11. Assertion : An aircraft flies along the meridian, the potential at the ends of its wings will be the same.
Reason : Whenever there is change in the magnetic flux e.m.f. induces.

12. Assertion : A spark occur between the poles of a switch when the switch is opened.
Reason : Current flowing in the conductor produces magnetic field.

13. Assertion : In the phenomenon of mutual induction, self induction of each of the coils persists.
Reason : Self induction arises when strength of current in same coil changes. In mutual induction, current is changing in both the individual coils.

14. Assertion : Lenz's law violates the principle of conservation of energy.
Reason : Induced e.m.f., opposes always the change in magnetic flux responsible for its production.

15. Assertion : The induced emf in a conducting loop of wire will be non zero when it rotates in a uniform magnetic field.
Reason : The emf is induced due to change in magnetic flux.

16. Assertion : An induced emf is generated when magnet is withdrawn from the solenoid.
Reason : The relative motion between magnet and solenoid induces emf.

17. Assertion : An artificial satellite with a metal surface is moving above the earth in a circular orbit. A current will be induced in satellite if the plane of the orbit is inclined to the plane of the equator.
Reason : The current will be induced only when the speed of satellite is more than 8 *km*/*sec*.

18. Assertion : A bar magnet is dropped into a long vertical copper tube. Even taking air resistance as negligible, the magnet attains a constant terminal velocity. If the tube is heated, the terminal velocity gets increased.
Reason : The terminal velocity depends on eddy current produced in bar magnet.

19. Assertion : A metal piece and a non-metal (stone) piece are dropped from the same height near earth's surface. Both will reach the earth's surface simultaneously.
Reason : There is no effect of earth's magnetic field on freely falling body.

20. Assertion : A transformer cannot work on dc supply.

Reason : dc changes neither in magnitude nor in direction.

21. Assertion : Soft iron is used as a core of transformer.

Reason : Area of hysteresis is loop for soft iron is small.

22. Assertion : An ac generator is based on the phenomenon of self-induction.

Reason : In single coil, we consider self-induction only.

23. Assertion : An electric motor will maximum efficient when back e.m.f. is equal to applied e.m.f.

Reason : Efficiency of electric motor is depends only on magnitude of back e.m.f..

24. Assertion : The back emf in a dc motor is maximum when the motor has just been switched on.

Reason : When motor is switched on it has maximum speed.