PHYSICS

RESONANCE ENGLISH

ELECTROMAGNETIC INDUCTION

Exercise

1. As shown in the figure, the key K is closed, the direction of the induced current in the coil B will be -

A. clockwise and instantaneous

B. anti-clockwise and instantaneous

C. clockwise and continuous

D. anti-clockwise and continuous

A. clockwise and instantaneous

B. anti-clockwise and instantaneous

C. clockwise and continuous

D. anti-clockwise and continuous

Answer: B

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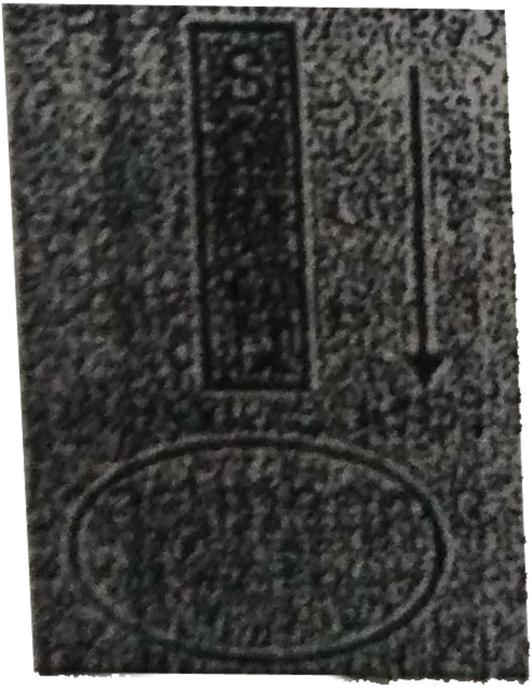
2. A copper ring is tied to a string and suspended vertically. On bringing a magnet towards the coil, as shown in the figure-



A. the ring will move away from magnet

B. the ring will move toward the magnet

C. the ring will remain stationary

D. none of these

A. the ring will move away from magnet

B. the ring will move towards the magnet

C. the ring will remain stationary

D. none of these

Answer: A

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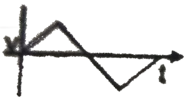
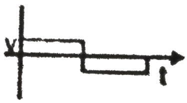
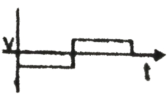
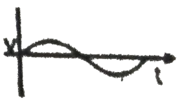
3. The graph between the current and the time for an inductance coil is shown below. Which of the following graph show the voltage-time variation-

A. (1) 

B. (2) 

C. (3) 

D. (4) 

Answer: C

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4. A metallic rod completes its circuit as shown in the figure. The circuit is normal to a magnetic field of $B = 0.15$ tesla. If the resistances of the rod is 3Ω the force required to move the rod with a constant velocity of $2m/\sec$ is-

A. $3.75 \times 10^{-3} N$

B. $3.75 \times 10^{-2} N$

C. $3.75 \times 10^{2} N$

D. $3.75 \times 10^{-4} N$

A. $3.75 \times 10^{-3} N$

B. $3.75 \times 10^{-2} N$

C. $3.75 \times 10^{2} N$

D. $3.75 \times 10^{-4} N$

Answer: A

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5. A small square loop of wire of side l is placed inside a large square loop of wire of side $L(L > > l)$. The loops are co-planer and their centres coincide. The mutual inductance of the system is proportional to

A. $\frac{l}{L}$

B. $\frac{l^2}{L}$

C. $\frac{L}{l}$

D. $\frac{L^2}{l}$

Answer: B

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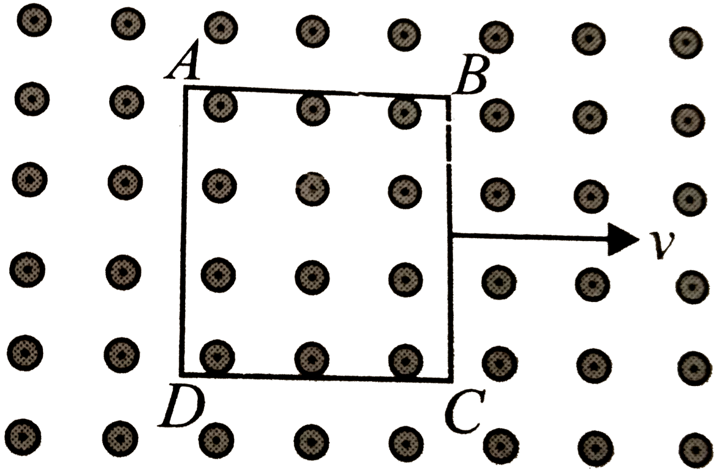
6. A metallic square loop ABCD is moving in its own plane with velocity v in a uniform magnetic field perpendicular to its plane as shown in figure. An electric field is induced



A. in AD, but not in BC

B. in BC, but not in AD

C. neither in AD, nor in BC

D. in both AD and BC

Answer: D

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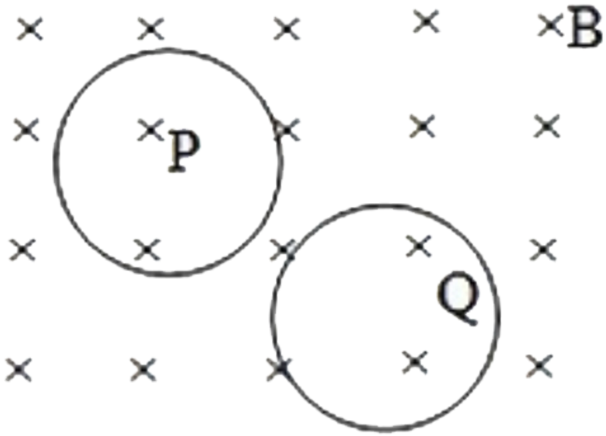
7. P and Q are two circular thin coils of some radius and subjected to the same rate of change of flux. If coil P is made up of copper and Q is made up of iron , then the wrong statement is



A. emf induced in the coils is the same

B. the induced current in P is more than that in Q

C. the induced current in P and Q are in the same direction

D. the induced current are the same in both the coils

Answer: D

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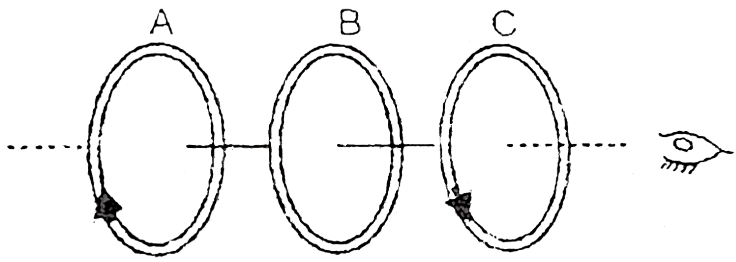
8. Three identical circular coils A, B and C are placed coaxial (with planes parallel to each other) The coils A and C carry equal currents in opposite direction as shown. The coils B and C are fixed in positions and the coil A is moved towards B with uniform motion then -



A. there is no induced current in B

B. current produced by A and C in B will be equal and opposite, therefore net curren in B is zero

C. there is an induced current in B which is in anticlockwise direction

D. there is an induced current in B which is in clockwise direction

Answer: C

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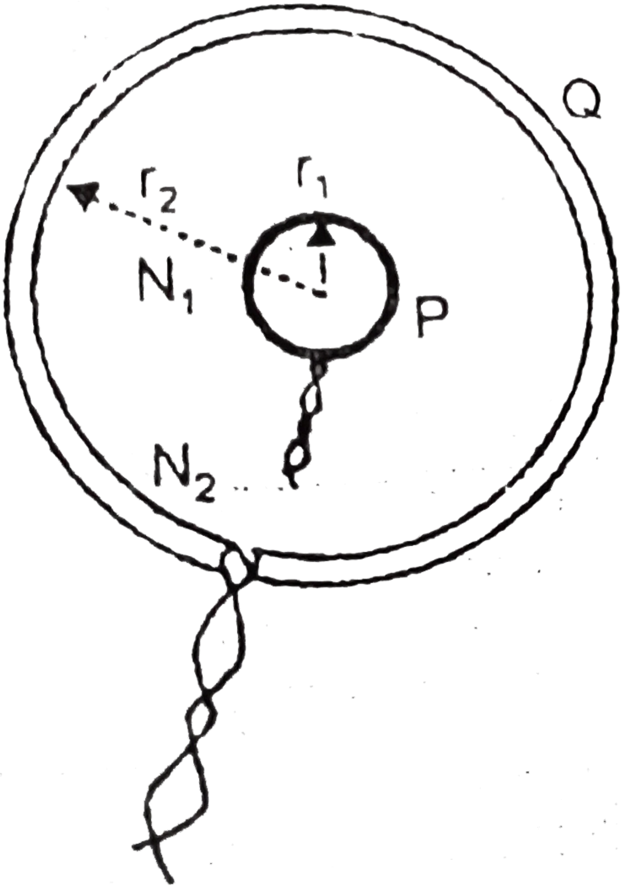
9. Two plane circular coils P and Q have radii r_1 and r_2, respectively, $(r_1 < < r_2)$ and are coaxial as shown in fig. The number of turns in P and Q are respectively N_1 and N_2. If current in coil Q is varied steadily at a rate x ampere/second then the induced emf in the coil P will be approximatery -



A. $\mu_0 N_1 N_2 \pi r_1^2$

B. $\mu_0 N_1 N_2 \pi r_1^2 x$

C. $\mu_0 N_1 N_2 \pi r_1^2 x \,/\, 2r_2$

D. zero

Answer: C

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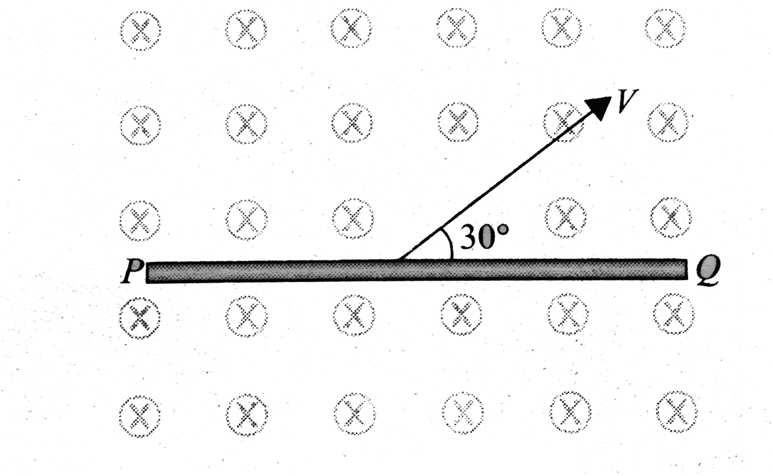
10. A conducting rod PQ of length $l = 2m$ is moving at a speed of $2ms^{-1}$ making an angle of 30° with its length. A uniform magnetic field $B = 2T$ exists in a direction perpendicular to the plane of motin. Then



A. $V_A - V_B = 8V$

B. $V_A - V_B = 4V$

C. $V_B - V_A = 8V$

D. $V_B - V_A = 4V$

Answer: B

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11. The horizontal component of earth's magnetic field is $3 \times 10^{-5} Wb/m^2$. The magnetic flux linked with a coil of area $1m^2$ and having 5 turns, whose plane is normal to the magnetic field, will be

A. $3 \times 10^{-5} Wb$

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

C. $15 \times 10^{-5} Wb$

D. zero

Answer: C

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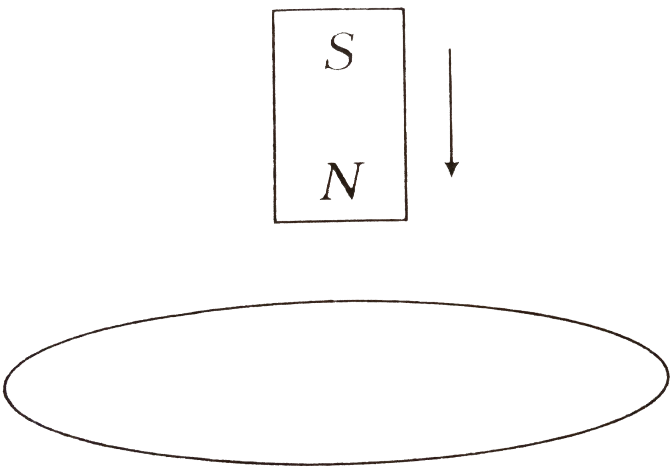
12. The north pole of a magnet is brought near a metallic ring as shown in the figure. The direction of induced current in the ring will be



A. in the clockwise direction

B. in the anticlockwise direction

C. initially in the clockwise and then anticlockwise direction

D. initially in the anticlockwise and then clockwise direction

Answer: B

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13. The unit of mutual inductance is-

A. volt

B. weber

C. tesla

D. henry

Answer: D

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14. In a step-down transformer input voltage is 200 volts and output voltage 5 volt. The ratio of nubmer of turns in it will be -

A. $1:40$

B. $40:1$

C. $20:1$

D. $1:20$

Answer: B

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15. Lenz's law is due to conservation of

A. charge

B. momentum

C. mass

D. energy

Answer: D

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16. On passing a current of 2A in a coil inductance 5H, the energy stored in it will be-

A. 100 joule

B. 10 joule

C. 20 joule

D. 5 joule

Answer: B

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17. A metal rod of length L is placed normal to a magnetic field and rotated through one end of rod in circular path with frequency f. The potential difference between it ends will be-

A. $\pi L^2 B f$

B. BL / f

C. $\pi L^2 B / f$

D. fBL

Answer: A

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18. The spokes of a wheel are made of metal and their lengths are of one metre. On rotating the wheel about its own axis in a uniform magnetic field of 5×10^{-5} tesla normal to the plane of the wheel, a potential difference of $3.14 mV$ is generated between the rim and the axis. The rotational velocity of the wheel is-

A. 63 rev/s

B. 50 rev/s

C. 31.4 rev/s

D. 20 rev/s

Answer: D

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19. When the primary current in the spark-coil of a car changes from 4A to zero in $10\mu S$, an emf of 40,000 V is induced in the secondary. The mutual inductance between the primary and the secondary windings of the spark-coil will be -

A. 1H

B. 0.1H

C. 10 H

D. zero

Answer: B

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20. The self-inductance of a coil is 2H. The current in the coil changes from 8A to 2.95 A in 0.01 s. The time constant of the coil will be -

A. 2s

B. 0.1s

C. 10 ms

D. 1 ms

Answer: C

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21. Area of a coil is $0.16m^2$. If the magnetic field through it changes from $0.1Wb/m^2$ to $0.5Wb/m^2$ in 0.02s, then the emf induced in the coil will be-

A. 1.6 V

B. 3.2 V

C. 4.8 V

D. 6.4 V

Answer: B

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22. What will increase in step-down transformer?

A. current

B. voltage

C. power

D. frequency

Answer: A

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23. If in a coil rate of change of area is $5m^2$ / milli second and current become 1 amp from 2 amp in 2×10^{-3} sec . If magnitude of field is 1 tesla self inductance of the coil is :

A. 2H

B. 5H

C. 20H

D. 10 H

Answer: D

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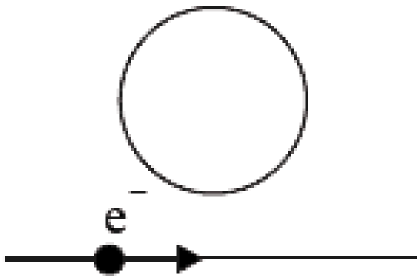
24. An electron beam is moving near to a conducting loop then the induced current in the loop :



A. clockwise

B. anticlockwise

C. first anticlockwise and then clockwise

D. no current

Answer: C

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25. The magnetic flux linked with a coil, in webers is given by the equation $\phi = 3t^2 + 4t + 9$. Then, the magnitude of induced emf at t = 2 s

A. 4V

B. 3V

C. 16V

D. 9V

Answer: C

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26. A metal conductor of length $1m$ rotates vertically about one of its ends at angular velocity 5 radians per second. If the horizontal component of earth's magnetic field is

$0.2 \times 10^{-4} T$, then the emf developed between the two ends of hte conductor is

A. 5 mV

B. $5 \times 10^{-4} V$

C. 50 mV

D. $50 \mu V$

Answer: D

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27. The resistance of a coil is 5 ohm and a current of 0.2A is induced in it due to a varying magnetic field. The rate of change of magnetic flux in it will be-

A. 0.5 W/b

B. 0.05 Wb/s

C. 1 W b/s

D. 20 Wb/s

Answer: C

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28. If the length and area of cross-section of an inductor remain same but the number of turns is doubled, its self-inductance will become-

A. half

B. four times

C. double

D. one-fourth

Answer: B

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29. Self-inductance of a solenoid depend on-

A. the number of turns N of the coil

B. the area of cross-section A and length l of the coil.

C. the permeability of the core of the coil

D. all the above

Answer: D

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30. When current flowing in a coil changes from 3A to 2A in one millisecond, 5 volt emf is induced in it. The self-inductance of the coil will be-

A. zero

B. 5kh

C. 5H

D. 5 mH

Answer: D

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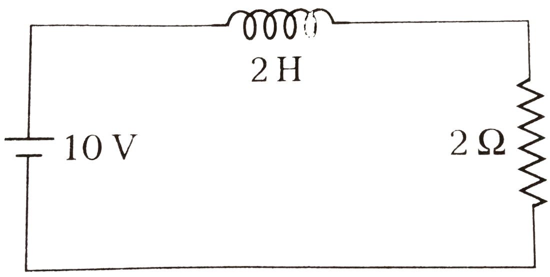
31. In the figure, magnetic energy stored in the coil is `



A. 0

B. ∞

C. 25 joules

D. none of these

Answer: C

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32. The self-inductance of solenoid of length L, area of cross-section S and having N turns is

A. $\frac{\mu_0 N^2 A}{L}$

B. $\frac{\mu_0 NA}{L}$

C. $\mu_0 N^2 LA$

D. $\mu_0 NAL$

Answer: A

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33. Energy is stored in the choke coil in the form of :

A. Heat

B. Electric energy

C. magnetic energy

D. electro-magnetic energy

Answer: C

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34. The self-inductances of two identical coils are 0.1H. They are wound over each other. Mutual inductance will be-

A. 0.1H

B. 0.2H

C. 0.01H

D. 0.05H

Answer: A

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35. The magnetic flux through Circuit of resistance R chages by an amount $\Delta\psi$ in a time Δt. Then the total quqntity in the circuit during thime Δt is respresented by

A. $Q = \dfrac{\Delta \phi}{R}$

B. $Q = \dfrac{\Delta \phi}{\Delta t}$

C. $Q = R. \dfrac{\Delta \phi}{\Delta t}$

D. $Q = \dfrac{1}{R}. \dfrac{\Delta \phi}{\Delta t}$

Answer: A

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36. A conducting circular loop is placed in a uniform magnetic field, B = 0.025 T with its plne perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of $1mms^{-1}$. The induced emf when the radius is 2 cm, is

A. $2\pi\mu V$

B. $\pi\mu V$

C. $\frac{\pi}{2}\mu V$

D. $2\mu V$

Answer: B

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37. Which of the following is proportional to energy density in magnetic field B:

A. $\frac{1}{B}$

B. $\frac{1}{B^2}$

C. B

D. B^2

Answer: D

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38. When two co - axial coils having same current in same direction are being close to each other then the value of current in both coils :

A. increases

B. decreases

C. first increases and then decreases

D. remain same

Answer: B

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39. A magnetic field can be produced by

A. A moving charge

B. A changing electric field

C. A stationary charge

D. Both (1) and (2)

Answer: D

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40. A bar magent is released into a copper ring directly below it . The acceleration of the magnet will be

A. g downwards

B. greater than g downwards

C. less than g downwards

D. bar will be stationary

Answer: C

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41. Lenz's law gives:

A. the magnitude of the induced emf

B. the direction of the induced current

C. both the magnitude and direction of the induced current

D. the magnitude of the induced current

Answer: B

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42. Statement 1: Electric field produced by changing magnetic field is nonconservative.

Statement 2: For the electric field $\overrightarrow{E}$ induced by a changing magnetic field which has closed lines of force, $\oint \overrightarrow{E} \,.\, \overrightarrow{dl} = 0$

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for

Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: A

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43. Assertion Two concentric conducting rings of different radii are placed in space. The mutual inductance of both the rings is maximum, if the rings are coplanar.

Reason For two co-axial conducting rings of different radii, the magnitude of magnetic flux in one ring due to current in other ring is maximum when both rings are coplanar.

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: A

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