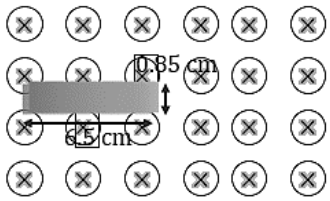
Q.1 A uniform magnetic field, $\vec{\mathbf{B}} = (3\hat{\mathbf{i}} + 4\hat{\mathbf{j}} + 5\hat{\mathbf{k}})$ **T**, exists in a region. A rod of length **5 m**, placed along **y** −axis, is moved along **x** −axis with constant speed of $\mathbf{1\ ms^{-1}}$. The magnitude of induced emf in the rod is -

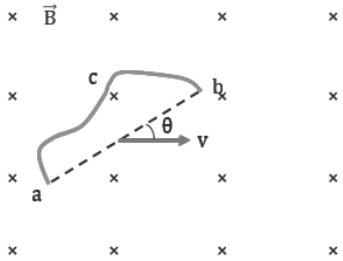
(A) Zero **(B)** 25 V **(C)** 5 V **(D)** 10 V

Q.2 A metal strip **6.50 cm** long, **0.85 cm** wide moves with constant velocity $\vec{\mathbf{v}}$ through a uniform magnetic field **B = 1.20 mT**, directed perpendicular to the strip, as shown in the figure. A potential difference of **3.90 μV** is measured between points **x** and **y** across the strip. Calculate the speed **v**.



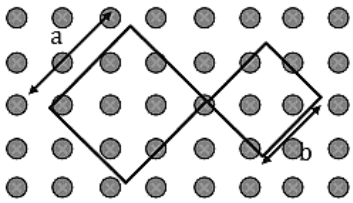
(A) 2.5 m/s **(B)** 5.5 m/s **(C)** 1.4 m/s **(D)** 0.4 m/s

Q.3 The figure shows an irregular shaped wire **acb** moving with velocity **v**, in a direction as shown in the figure. What is the induced emf in the wire?
Take $ab = L$



(A) BvLCosθ **(B)** 2BvL **(C)** BvL **(D)** BvLSinθ

Q.4 A plane loop shown in the figure is shaped in the form of **two** squares with sides **a** and **b** is introduced into a uniform magnetic field at right angles, to the loop's plane. The magnetic induction varies with time as **B = B0sinωt**. Find the amplitude of the current induced in the loop if its **resistance per unit length** is equal to **r**. The induction of the loop is negligible.

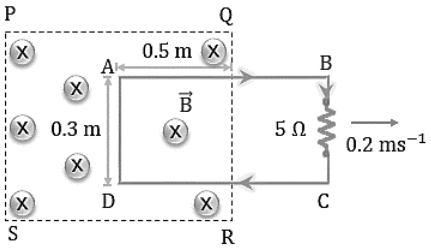


(A) $\frac{(a-b)B_0\omega}{r}$ **(B)** $\frac{1}{2}\frac{(a-b)B_0\omega}{r}$ **(C)** $\frac{1}{4}\frac{(a-b)B_0\omega}{r}$ **(D)** $\frac{2(a-b)B_0\omega}{r}$

Q.5 A conducting rod of length **l** is moved with a constant velocity $\vec{\mathbf{v}}$ in a magnetic field $\vec{\mathbf{B}}$. A potential difference appears across the two ends

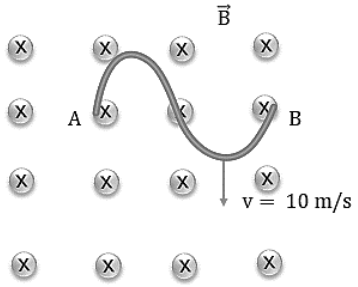
(A) If $\vec{v} \parallel \vec{l}$ **(B)** If $\vec{v} \parallel \vec{B}$ **(C)** If $\vec{l} \parallel \vec{B}$ **(D)** None of these

Q.6 A circuit **ABCD** is held perpendicular to the uniform magnetic field of $\mathbf{B = 5 \times 10^{-2}\ T}$ extending over the region **PQRS** and directed into the plane of the paper. The circuit is moving out of the field at a uniform speed of $\mathbf{0.2\ ms^{-1}}$ for $\mathbf{1.5\ s}$. During this time, the current in the $\mathbf{5\ \Omega}$ resistor is



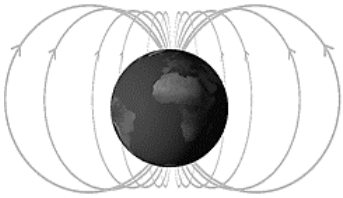
(A)0.6 mA From B to C **(B)**0.9 mA from B to C
(C)0.9 mA From C to B **(D)**0.6 mA from C to B

Q.7 A wire shown in the figure is moving with a velocity of $\mathbf{10\ m/s}$ in the magnetic field of magnitude $\mathbf{0.3\ T}$. If the distance between the points **A** and **B** is **15**



(A)0 V **(B)**0.9 V **(C)**1.25 V **(D)**0.45 V

Q.8 The two rails of a railway track, insulated from each other and from the ground, are connected to a millivolt meter. What will be the reading of the millivolt meter when a train travels on the track at a speed of $\mathbf{180\ kmh^{-1}}$? The vertical component of earth's magnetic field is $\mathbf{0.2 \times 10^{-4}\ T}$ and the rails are separated by $\mathbf{1\ m}$

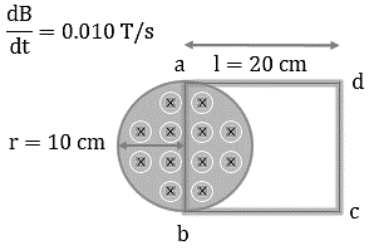


(A)2 mV **(B)**2.5 mV **(C)**1 mV **(D)**5 Mv

Q.9 Consider the following two statements:
(**A**) An emf can be induced by moving a conductor in a magnetic field.
(**B**) An emf can be induced by changing the magnetic field.
(A) Both A and B are true. **(B)**A is true, but B is false.
(C)B is true, but A is false. **(D)**Both A and B are false.

Q.10 A uniform magnetic field **B** exists in a cylindrical region of radius **10 cm** as shown in the figure. A uniform wire of length **80 cm** and resistance $\mathbf{4.0\ \Omega}$ is bent into a square frame and is placed with one

side along the diameter of the cylindrical region. If the magnetic field increases at a constant rate of**0. 010 T/s**, find the current induced in the frame.



(A) 3.9×10^{-5} A **(B)** 3.9×10^{-4} A **(C)** 1.5×10^{-4} A **(D)** 1.7×10^{-5} A

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(D)	(D)	(C)	(D)	(A)	(D)	(C)	(A)	(A)