MODEL ANSWER
A2 PHYSICS
MAGNETIC FIELD & EM INDUCTION

3. Horizontal component = $4.8 \times 10^{-5} \times \cos 66°$
$= \underline{1.95 \times 10^{-5}\ T}$

Speed after 2 second, v = u + at
= 0 + gt
v = gt
= 9.81 X 2
= $\underline{19.62\ m\ s^{-1}}$

Magnitude of induced voltage, $V = B\ l\ v$
$= 1.95 \times 10^{-5} \times 2.5 \times 19.62$
$= \underline{9.56 \times 10^{-4}\ V}$

If the rod is place along north-south direction, there's no cutting of magnetic flux, therefore the induced e.m.f. is zero.

4.The blade's resistance is increased by cutting away the aluminium.

Faraday's Law of Electromagnetic Induction states that the magnitude of an induced e.m.f. is directly proportional to the rate of change of magnetic flux linkage.

The oscillations of blade A are rapidly damped. As the blade A, which has low resistance, oscillates between the permanent magnet, there's a cutting of magnetic field line resulting in induced e.m.f and flow of current. Lenz's Law shows that the direction of these current is such that they oppose the motion of the blade, where two magnetic field produce an opposing force, and so damp its swing. While swinging from one side and cutting through the magnetic flux induces a eddy current, swinging from the other side and cutting through the magnetic flux induces eddy current in another direction. Kinetic energy has been converted to thermal energy, contributing to heat dissipation. As a result, damping occur very rapidly.
Slot cuts in the blade greatly reduce the flow of eddy current as the resistance is higher, therefore weaker magnetic field surrounding it is created. However it has lower magnitude to oppose the magnetic field between two permanent magnet. Therefore it is lightly damped.

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