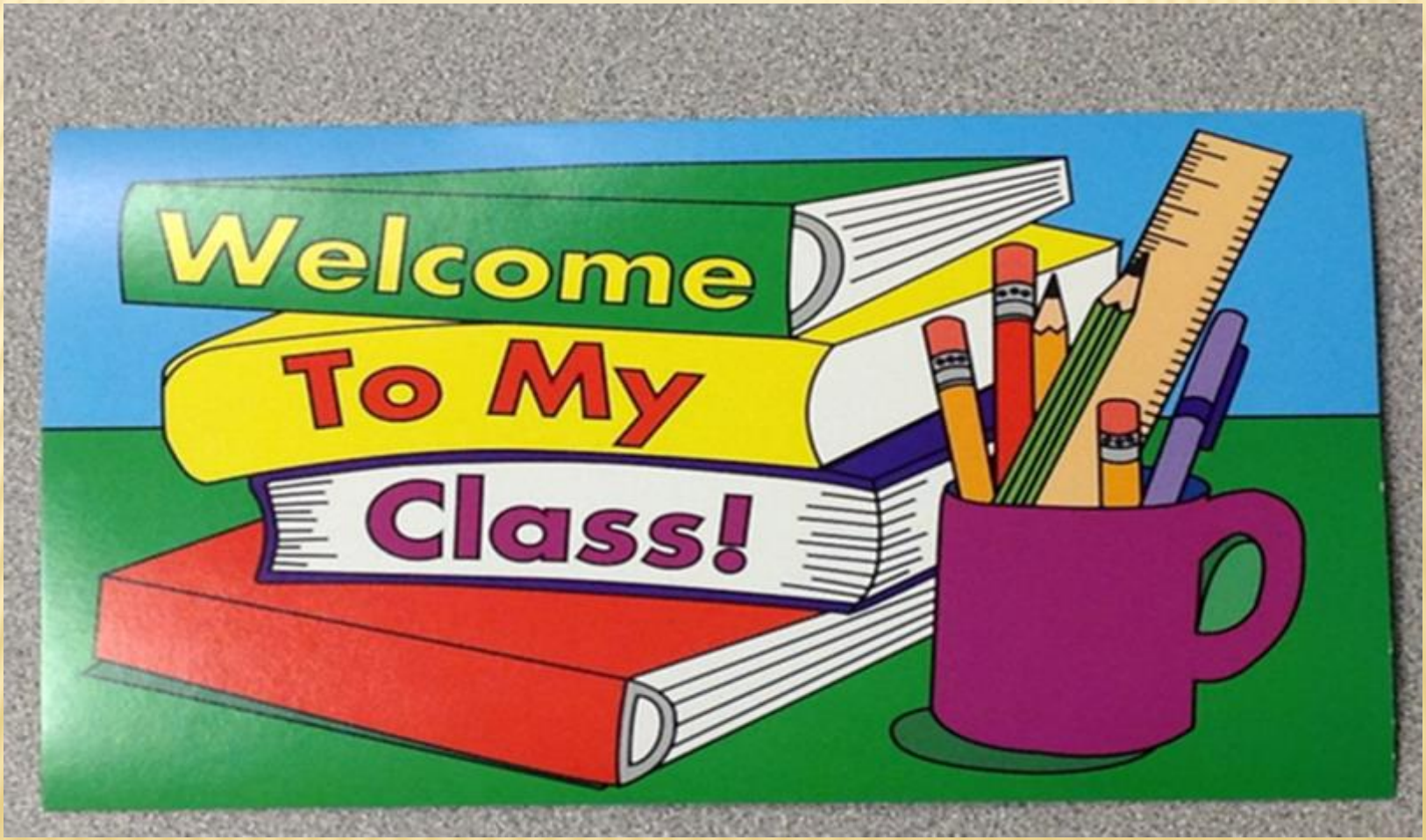
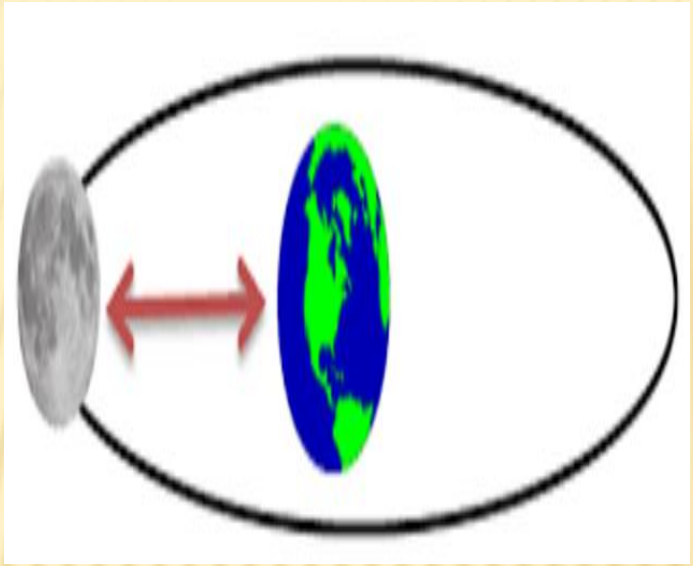
Pakistan School
Kingdom of Bahrain

CLASS: 10 SUBJECT : PHYSICS



ENGAGING STARTER

- Identify the types of motion:



TOPIC

1. Simple harmonic motion in

2. Mass spring system

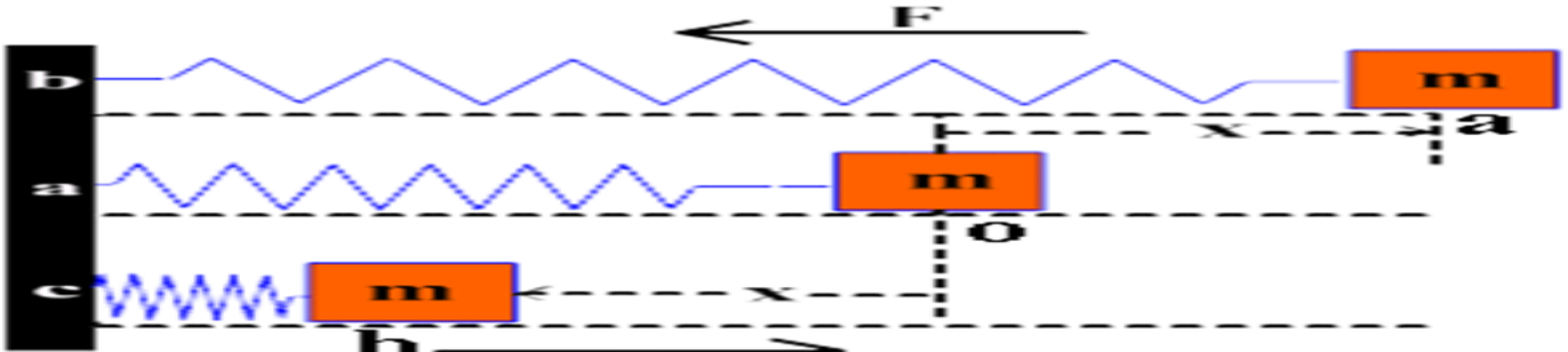
3. Ball and bowl system

OBJECTIVE:

- At the end of this lesson students will be able to :
- Describe simple harmonic motion in ball and bowl system and inter conversion of energies during SHM.

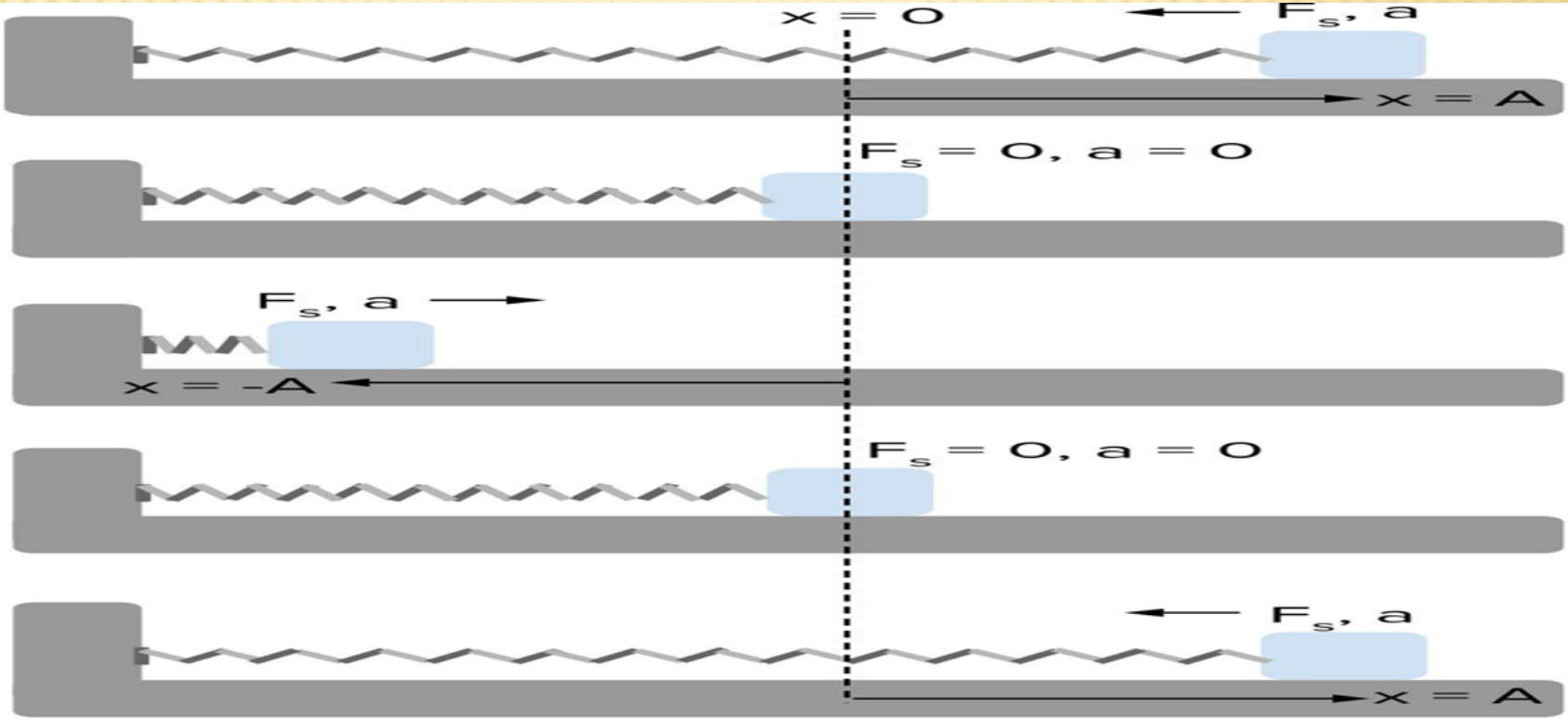
SPEED OF MASS ATTACHED WITH A SPRING BETWEEN POSITION A AND B:

- Speed of mass attached with a spring between position A and B:
- i. When the body is disturbed from O to A on ceasing the external force, body starts moving towards the mean position O under the action of restoring force.
- ii. When the body is about to reach at O its velocity is maximum.
- iii. Due to inertia, body does not stop at point O but continues its motion towards point B, when it reaches



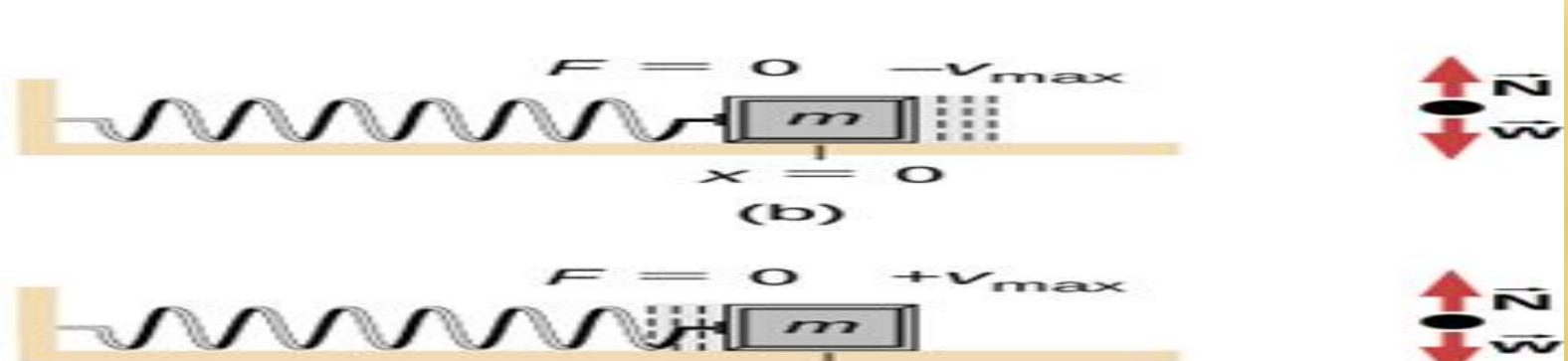
$a \alpha -x$

- Acceleration at mean position =zero
- Acceleration at extreme positions =maximum



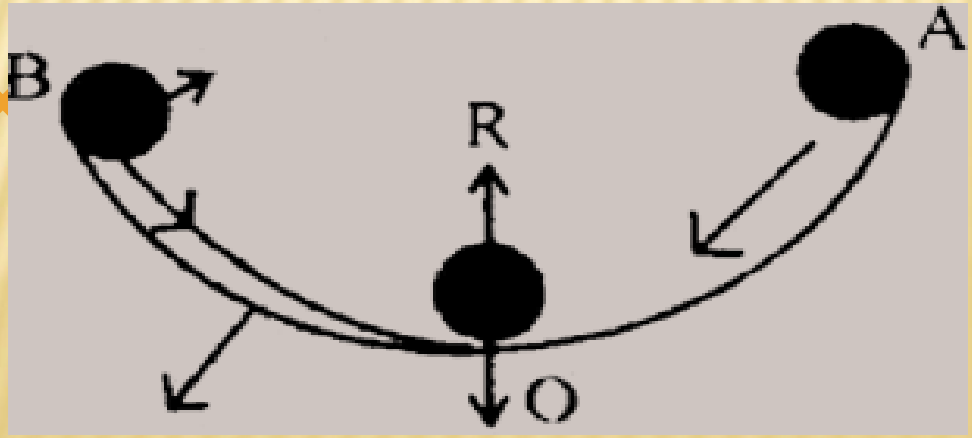
FORCES ACTING ON MASS SPRING SYSTEM:

- Vertical forces acting on the mass attached with a spring:
- When the body is at mean position O the force acting on the mass is zero. Because at this position two vertical forces i.e. The weight of the body acting downward is equal to the upward normal reaction of the horizontal surface. Hence, they cancel out effect of each other so there is no motion.



Q: **Explain the motion of ball in a bowl. Show that it is simple harmonic motion.**

- The motion of a ball placed in a bowl is
- An example of simple harmonic motion.
- At Mean Position:
- When the ball is at the mean position ‘O’, that is, at the center of the bowl, net (force acting on the ball is zero. In this position weight of the ball acts downward and is equal to the upward normal force of the surface of the bowl.

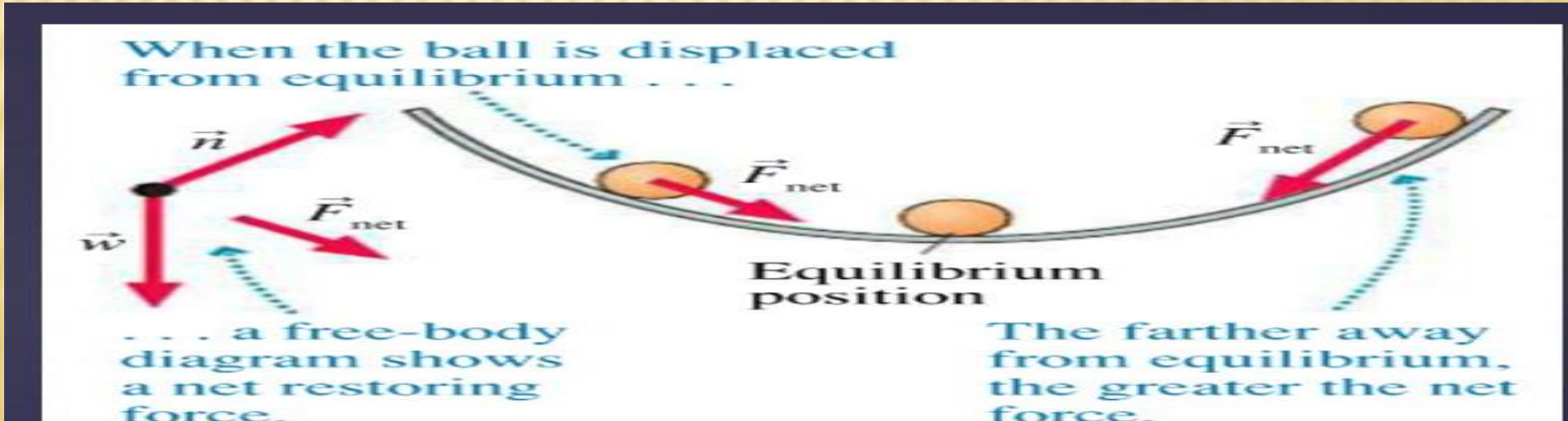


AT POSITION A

- Hence there is no motion. Now if we bring the ball to position ‘A’ and then release it, the ball will start moving towards the mean position ‘O’ due to the restoring force caused by its weight. At position ‘O’ the ball gets maximum speed and momentum and moves towards extreme position ‘B’ due to inertia.

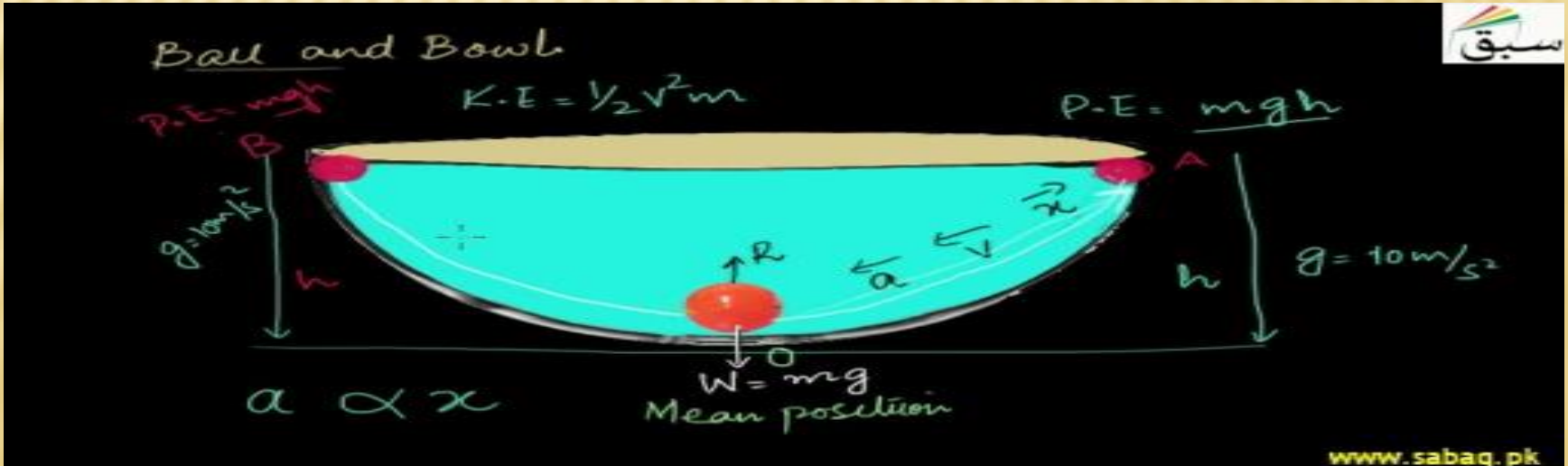
AT POSITION B

- While going towards the posit ion “B” the speed of the ball decreases .
  due to restoring force which acts towards the mean position. At the position “B” the ball stops for a while and then again moves towards the position “O” because of restoring force and does not stop at O will go up to A, till all its energy lost due to friction. Thus to and fro motion of the ball about mean position placed in a bowl is an example of simple harmonic motion.



ENERGY CONVERSION DURING SHM

- At mean position
- K.E = maximum
- P.E = minimum / zero
- At extreme position
- K.E = zero / minimum
- P.E = maximum



PLENARY

1. Mass spring system executing special type of vibratory motion called .....
2. Speed of mass attached by spring during SHM is .....at mean position. (maximum /zero).
3. When body is at mean position force acts on body is zero . YES / NO.
4. Potential energy is maximum at mean position. T / F
5. From point A the ball will move in a bowl by .....force. (External force /restoring force)

HOME WORK

- Explain the energy conversion in ball and bowl system executing SHM. Also draw the figure.


STAY HOME!
STAY SAFE!

- ALLAH HAFIZ