Work and Energy

Assertion & Reason Type Questions

Directions : Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

c. Assertion (A) is true but Reason (R) is false.

d. Assertion (A) is false but Reason (R) is true.

Q1. Assertion (A): Work has no magnitude and no direction.

Reason (R): 1 J is the amount of work done on an object when a force 1N displaces it by 1 m along the line of action of force.

Answer : (d) Assertion (A) is false but Reason (R) is true. Assertion (A) is false because work has only magnitude and no direction.

Q2. Assertion (A): Work done is zero when the displacement of the object is zero.

Reason (R): Work done is equal to the magnitude of the force multiplied by the distance moved in the direction of the force.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q3. Assertion (A): When the force retards the motion of a body, the work done is negative.

Reason (R): Work done depends on angle between force and displacement.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

When the force retards the motion, the force and displacement are in opposite directions to each other. Hence, the work done by the force is negative.

Q4. Assertion (A): No work is done when a woman carrying a load on her head, walks on a level road with a uniform velocity.

Reason (R): No work is done if force is perpendicular to the direction of displacement.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Work done

$$W = \vec{F} \cdot d\vec{s} = Fds \cos\theta = 0 \text{ when } \theta = 90°.$$

No work is done when force is perpendicular to the displacement.

Q5. Assertion (A): A falling coconut, a flying aircraft and a running athlete possess kinetic energy.

Reason (R): Kinetic energy is the energy possessed by an object due to its motion.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q6. Assertion (A): According to law of conservation of mechanical energy, change in potential energy is equal and opposite to the change in kinetic energy.

Reason (R): The sum total of an object's kinetic and potential energy at any given point in time is its total mechanical energy.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

The sum total of an object's kinetic and potential energy at any given point in time is its total mechanical energy.

Q7. Assertion (A): If a light body and a heavy body possess the same momentum, the lighter body will possess more kinetic energy.

Reason (R): The kinetic energy of a body varies as the square of its velocity.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

The momentum of an object is directly proportional to its velocity whereas the kinetic energy is directly proportional to the square of velocity. If the momentum of the two objects is same, the lighter object has greater velocity and hence more kinetic energy.

Q8. Assertion (A): A spring has potential energy, both when it is compressed or stretched.

Reason (R): In compressing or stretching, work is done on the spring against the restoring force.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

When spring is compressed or stretched, the work is done on the spring. Due to this work, the energy gets stored in it as elastic potential energy.

Q9. Assertion (A): A winded toy car, when placed on floor, starts moving.

Reason (R): Toy car has kinetic energy stored in it which facilitates its motion.

Answer : (c) Assertion (A) is true but Reason (R) is false.

Reason (R) is false because when a toy car is winded, work done on it gets stored in the form of elastic potential energy and when it is placed on the ground, this elastic potential energy slowly converts into kinetic energy of the toy and facilitates its motion.