



Junior Physics Olympiad (JPO)

Sample Question Paper – Class IX

1. Every morning, Arjun cycles from his home to school. His route consists of a straight road followed by a curved road around a park. According to his cycle's speedometer, he covers a total distance of 3 km in 10 minutes. His friend Meena, however, points out that the straight-line distance between Arjun's home and school, measured using a digital map, is only 2.4 km. During a classroom discussion, four students make different statements about Arjun's journey.

Who has made the correct statement?

- A. Arjun's distance and displacement are always equal.
- B. Distance depends on the actual path travelled, while displacement depends only on the initial and final positions.
- C. Since Arjun moved on a curved path, displacement cannot be measured.
- D. Distance is always smaller than displacement.

2. A toy car is tested in a school laboratory. It starts from rest and moves on a straight track. Every second, the teacher records its velocity and plots a velocity-time graph. The graph is a straight line rising uniformly from the origin. Rahul observes that the slope of the graph is constant. Sneha says that this means the car is moving with constant velocity. Vivek argues that the graph actually represents constant acceleration.

Which statement is scientifically correct?

- A. Rahul and Sneha are both correct.

- B. Only Sneha is correct.
- C. Only Vivek is correct.
- D. None of the students is correct.

3. Two express trains move on parallel tracks in the same direction. Train A travels at 90 km/h, while Train B moves at 60 km/h. A passenger sitting inside Train A looks out of the window and observes Train B. At the same time, another passenger standing on the railway platform watches both trains pass by.

The passenger inside Train A will observe Train B moving with a speed of

- A. 30 km/h
- B. 60 km/h
- C. 90 km/h
- D. 150 km/h

4. A rescue boat attempts to cross a river. The boat moves due north at 8 m/s relative to water, while the river current flows due east at 6 m/s. A drone flying above records the actual path of the boat. One student predicts that the boat will move north because the boatman is rowing north. Another predicts that the river current completely determines the motion.

Ignoring water resistance, what is the magnitude of the boat's velocity relative to the ground?

- A. 2 m/s
- B. 10 m/s
- C. 14 m/s
- D. 48 m/s

5. A smooth hockey puck is struck on a nearly frictionless ice rink. After the stick loses contact with the puck, it continues moving in a straight line with nearly constant speed for several metres. During a discussion, four students explain why the puck keeps moving.

Which explanation agrees with Newton's First Law?

- A. The force of the stick continues to act even after contact ends.
- B. The puck carries a stored force inside it.
- C. In the absence of a significant unbalanced force, the puck continues its motion due to inertia.
- D. The ice continuously pushes the puck forward.

6. A loaded truck and a motorcycle are travelling at exactly 40 km/h on the same road. Suddenly, both drivers apply brakes simultaneously. A student argues that both vehicles have the same momentum because their speeds are equal. Another student disagrees, pointing out that momentum depends on more than speed.

Which statement is correct?

- A. Both have equal momentum.
- B. The truck has greater momentum because momentum depends on mass as well as velocity.
- C. The motorcycle has greater momentum because it stops more quickly.
- D. Momentum depends only on speed.

7. A school plans to construct a children's playground. Four different surfaces are being considered for the slide:

- Highly polished steel
- Rough concrete
- Rubber sheet
- Sandpaper-coated metal

The engineers want children to slide smoothly with the least resistance while still maintaining safety.

Which surface offers the least friction?

- A. Sandpaper-coated metal
- B. Rough concrete
- C. Rubber sheet
- D. Highly polished steel

8. Two students travel from Earth to the Moon. While standing on the Moon, they notice that they can jump much higher than on Earth. One student concludes that both their mass and weight have decreased. The other argues that only one of these quantities changes.

Which statement is scientifically correct?

- A. Both mass and weight decrease.
- B. Mass decreases but weight remains constant.
- C. Mass remains constant while weight decreases.
- D. Both mass and weight remain constant.

9. A roller coaster starts from the top of a hill and moves downward without any engine. As it descends, its speed increases continuously. Assuming that friction and air resistance are negligible, which statement best describes the energy conversion taking place?

- A. Kinetic energy changes into potential energy.

B. Potential energy changes into kinetic energy while total mechanical energy remains constant.

C. Mechanical energy continuously decreases.

D. Heat energy is converted into kinetic energy.

10 . A group of students measures the diameter of a metal ball using a Vernier caliper. Their readings are:

- 2.41 cm
- 2.42 cm
- 2.40 cm
- 2.41 cm

One student immediately records 2.42 cm as the final answer because it is the largest reading. Another chooses 2.40 cm because it is the smallest. The teacher advises the class to follow proper scientific practice before reporting the result.

What should the students do?

A. Select the largest reading.

B. Select the smallest reading.

C. Calculate the average of the consistent measurements and report it as the best estimate.

D. Ignore all readings and repeat the experiment on another object.

11. A space agency launches two artificial satellites around Earth. Satellite P is placed in a low Earth orbit, while Satellite Q is placed much farther away from Earth. During a classroom discussion, one student says that the gravitational force acting on Satellite Q must be greater because it covers a larger orbit. Another student argues that gravity becomes weaker as the

distance from Earth increases, although it never becomes exactly zero.

Which statement best agrees with Newton's law of gravitation?

A. Gravity is the same at all distances from Earth.

B. Gravity becomes stronger as the satellite moves farther away.

C. Gravity becomes weaker with increasing distance but never completely disappears.

D. Satellites move only because there is no gravity in space.

12. Two identical carts are placed on a smooth horizontal track. Cart A is initially at rest. Cart B is pushed with a constant force for five seconds. During this interval, students observe that the speed of Cart B increases uniformly. One student claims that the force is creating motion, while another says the force is actually changing the cart's velocity.

Which statement is scientifically correct?

A. Force only creates motion.

B. Force changes the state of motion by producing acceleration.

C. Force always produces constant velocity.

D. Force has no relation with acceleration.

13. A student performs an experiment using two low-friction trolleys on a laboratory track. One trolley moves towards another identical trolley that is initially at rest. After collision, both trolleys move together with the same velocity. The teacher asks the class which physical quantity remains

conserved during the collision if external forces are negligible.

Which answer is correct?

- A. Kinetic energy only
- B. Speed of each trolley
- C. Linear momentum of the system
- D. Mechanical power

14. A child pushes an empty shopping trolley in a supermarket. Initially the trolley is at rest. As the child continues pushing, the trolley gradually moves faster. The child's father explains that the work done by the applied force has changed the trolley's kinetic energy.

Which physical principle best explains this observation?

- A. Newton's Third Law
- B. Conservation of Momentum
- C. Work-Energy Theorem
- D. Law of Gravitation

15. A science teacher ties one end of a long rope and asks two students to generate waves by moving the free end up and down. In the first trial they move their hands slowly. In the second trial they move them much faster while keeping the height of oscillation almost unchanged. Students notice that the number of waves produced every second has increased.

Which property of the wave has definitely increased?

- A. Amplitude
- B. Frequency
- C. Wave speed in the rope
- D. Wavelength only

16. A group of students is standing near a large mountain during an educational trip. One student shouts loudly and hears an echo after a short interval. Another student standing much closer to the mountain does not hear any echo at all.

The most appropriate explanation is that

- A. the mountain absorbs all sound.
- B. the second student shouted too softly.
- C. the reflected sound reached the listener before the human ear could distinguish it as a separate sound.
- D. sound cannot reflect from mountains.

17. Four students draw different distance-time graphs for four moving objects.

- Graph P is a straight line with constant slope.
- Graph Q is a horizontal line.
- Graph R becomes steeper with time.
- Graph S becomes less steep with time.

Which graph represents an object moving with uniform speed?

- A. Graph P
- B. Graph Q
- C. Graph R
- D. Graph S

18. A laboratory group measures the time taken by a pendulum for ten oscillations. Instead of taking only one reading, the teacher asks them to repeat the measurement five times and calculate the average.

Why is this considered good scientific practice?

- A. It completely removes all experimental errors.
- B. It reduces the effect of random errors and improves reliability.
- C. It increases the speed of the experiment.
- D. It changes the true value of the measurement.

19. A football is kicked across a playground. While moving on the ground, it gradually slows down and finally stops. During a discussion, one student says the ball stopped because its force was used up. Another says friction acted continuously against its motion. A third student argues that inertia alone should have kept the ball moving forever.

Which explanation is scientifically correct?

- A. The ball lost all its force.
- B. Friction provided an unbalanced force opposite to the motion.

C. Inertia always stops moving objects.

D. Gravity stopped the ball.

20. A student performs the following three experiments.

- **Experiment I: A stone is dropped from a height.**
- **Experiment II: A trolley moves with constant velocity on a nearly frictionless track.**
- **Experiment III: A satellite revolves around Earth in a circular orbit.**

The student claims that acceleration is present in all three experiments.

Which statement correctly evaluates the claim?

- A. Only Experiment I has acceleration.
- B. Experiments I and II have acceleration.
- C. Experiments I and III have acceleration.
- D. All three experiments have acceleration.