Sample Paper – 2015
Class – XI
Subject - Physics

Summative Assessment 1

Time: 3 Hrs MM:70

Set A

General Instructions:

(i) All questions are compulsory.
(ii) Q.No. 1 to 5 are very short answer type questions, carrying one mark each.
(iii) Q.No numbers 6 to 10 are short answer type questions, carrying two marks each.
(iv) Q.No. 11 to 22 are also short answer type questions, carrying three marks each.
(v) Q.No. 23 is a value based question carry 4 mark.
(vi) Q.No 24 to 26 are long answer type questions, carrying five marks each.

1. Write the number of significant figures in each of the following measurements:
(a) 1.674×10^{-27} kg (b) 0.027500 cm

2. Two balls of different masses (one light and other heavier) are thrown vertically upwards with the same initial speed. Which one will rise to the greater height?

3. A lift is falling under gravity, What is the time period of the pendulum attached to its ceiling?

4. Is it possible that a body be in accelerated motion under a force acting on a body, yet no work is being done on the body by force? Explain your answer by suitable example.

5. Two identical particles moves towards each other with velocities v and 2v respectively. What will be the velocity of their center of mass?

6. Distinguish between the terms precision and accuracy of a measurement?

7. A light body and a heavy body have the same momentum. Which one will have the greater kinetic energy?

8. Name the physical quantity that corresponds to the moment of force. On what factor does it depends?

9. If no external torque act on a body, will its angular velocity remains constant.

10. Explain if ice on the polar caps of the earth melts, How will it affect the duration of the day .

11. Draw the following graphs between distance and time of object in case of (i) for a body moving with constant velocity. (ii) for a body moving with constant acceleration.

12. A person sitting in a moving train throws a ball vertically upwards. How will the ball appear to move to an observer (i) sitting inside the train (ii) standing outside the train? Give reason?

13 Define angle of friction. Deduce its relation with coefficient of friction.

14. Define potential energy in context with a conservative force.

15. Calculate the velocity of a bob of simple pendulum at its mean position if it is able to rise to a vertical height of 10 cm. Take g = 9.8 m/s^2

16. From a uniform disc of radius R, a circular hole of radius R/2 is cut out. The centre of the hole is at R/2 from the centre of the original disc. Locate the centre of mass of the resulting flat body.

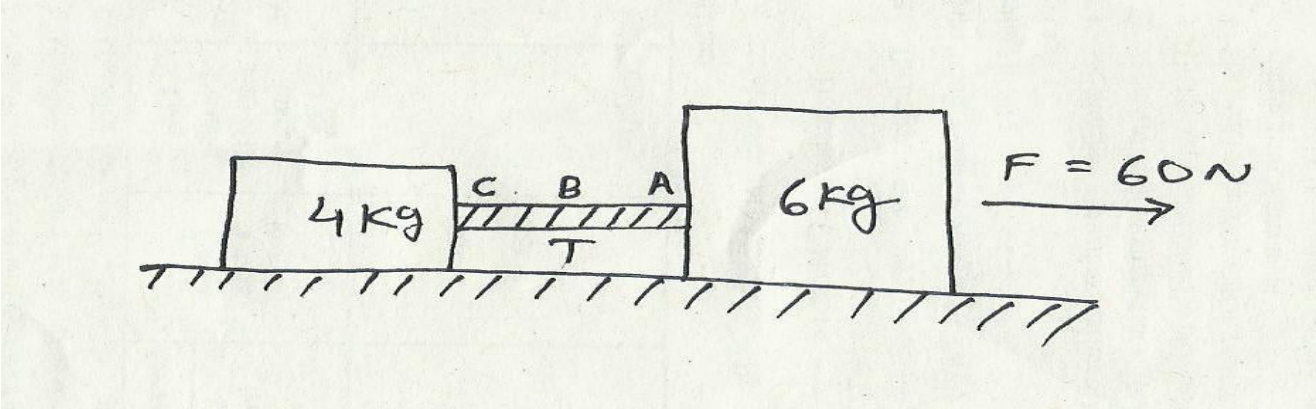
17. Derive an expression for moment of inertia of a ring about an axis through the center and perpendicular to its plane.

18. How can the method of dimensions be used to deduce a relation among the physical quantities? Explain it with the help of suitable examples.

OR

A pendulum bob of mass 10^{-2} kg is raised to a height of 15 x 10^{-2} and then released at the bottom of its swing, it picks up the mass of 10 $^{-3}$ kg. To what height will the combine mass rise.

19. Two blocks of masses 6 kg and 4 kg connected by a rope of mass 2 kg are resting on frictionless floor. If a constant force of 60 N is applied to 6 kg block, find the acceleration of the system and the tension in the rope at points A, B, and C.



20. At what angle should a body be projected with a velocity 24 m/s just to pass over the obstacle 16 m high at a horizontal distance of 32 m?
OR
What is friction? State the laws of limiting friction. What are the factors on which coefficient of friction depend. Also write the units of coefficient of kinetic and rolling friction.

21 A monkey of mass 40 kg climbs on a rope which can stand a maximum tension of 600 N in which of the following case will the rope breaks: the monkey

(i) Climbs up with an acceleration of 6 m/s^2
(ii) Climbs down with an acceleration of 4 m/s^2
(iii) Fall down the rope nearly freely under gravity.

22. A bullet of mass 0.001 kg and travelling at a speed of 500 m/s strikes a mass of block 2 kg which is suspended by string of length 5m. The center of gravity of block is found to rise a vertical distance of 0.1m. What is the speed of the bullet after it emerges from the block?

23 Having seen a big stone falling from the top of a tower Ravi pulled his friend Kiran away. The stone hit Ravi slightly and he got hurt. But he was saved from a major accident.

(i) What made Ravi act in such a way.

(ii) From the top of a tower 100 m in height, a ball is dropped and at the same time another ball is projected vertically upwards from the ground with a velocity of 25 m/s. Find when and where the two balls meet. Take g = 9.8 m/sec2.

24. What do you mean by Banking of roads. What is the need of banking a circular road. Discuss the motion of car on banked circular road(with friction).

A vehicle running with speed 72 km/hr applies brakes producing a retardation of 3 m/s^2 while taking a turn of radius 100 m. Find the centripetal acceleration.

OR

Having seen a big stone falling from the top of a tower Ravi pulled his friend Kiran away. The stone hit Ravi slightly and he got hurt. But he was saved from a major accident. (a)What made Ravi act in such a way. (b)From the top of a tower 100 m in height, a ball is dropped and at the same time another ball is projected vertically upwards from the ground with a velocity of 25 m/s.Find when and where the two balls meet. Take g = 9.8 m/sec^2.

25. (i) Deduce expressions using vector diagrams for velocity and acceleration of an object in uniform circular motion. (b) In a circus, the diameter of the globe of death is 20 m From what minimum height must a cyclist start in order to go round the globe successfully ?

OR

(i) Show that for two complementary angles of projection of a projectile thrown with the same velocity, the horizontal ranges are equal.

(iii) A cricket ball is thrown at a speed of 28 m/s in a direction 30^0 above the horizontal. Calculate

Maximum height attained and time taken by the ball to return to the same level.

26. State and prove the principle of conservation of linear momentum. Apply the law to explain why a gun recoil, a rocket goes up when fired and a boat moves away when a man jump from it to the shore.

OR

A 70 kg man stand in contact against the wall of a cylindrical drum of radius 3 m rotating about its vertical axis with 200 rev/min. The coefficient of friction between the wall and his clothing is 0.15. What is the minimum rotational speed of the cylinder to enable the man to remain stuck to the wall (without falling) when the floor is suddenly removed?

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1. Convert one joule to electron volt.

2. Does a scalar quantity depend on the frame of reference chosen?

3. A motor cyclist is going in a vertical circle. What is the necessary condition that he may not fall down?

4. What happen to the potential energy when two protons are brought together?

5. What is the difference between centre of gravity and centre of mass?

6. A new system of units is proposed in which unit of mass is α kg, unit of length is β m and unit of time is γ s. How much will 5 J measure in this new system?

7. A light body and a heavy body have the same momentum. Which one will have the greater kinetic energy?

8. How does Newton's second law of motion leads to the concept of inertial mass?

9 Why it is easier to open a tap with two fingers than with one finger?

10. Show that the slope of the displacement time graph is equal to velocity of uniform motion.

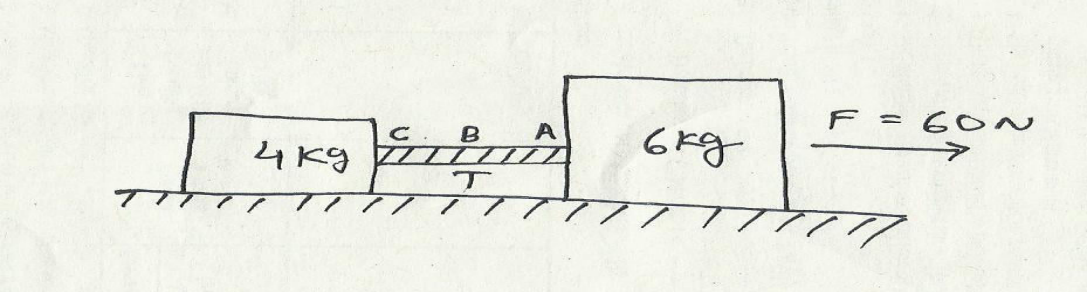
11 Explain if ice on the polar caps of the earth melts, how it will affect the duration of the day.

12. What are the characteristics of uniform motion.

13. Define angle of friction. Deduce its relation with coefficient of static friction?

14. If the linear momentum of a body is increased by 100 % what will be the % increase in the kinetic energy of the body.

15. Two blocks of masses 6 kg and 4 kg connected by a rope of mass 2 kg are resting on frictionless floor. If a constant force of 60 N is applied to 6 kg block, find the acceleration of the system and the tension in the rope at points A, B, and C.



16. From a uniform disc of radius R, a circular hole of radius R/2 is cut out. The centre of the hole is at R/2 from the centre of the original disc. Locate the centre of mass of the resulting flat body.

17. Derive an expression for the moment of inertia of a thin uniform rod about an axis through its center and perpendicular to its length.

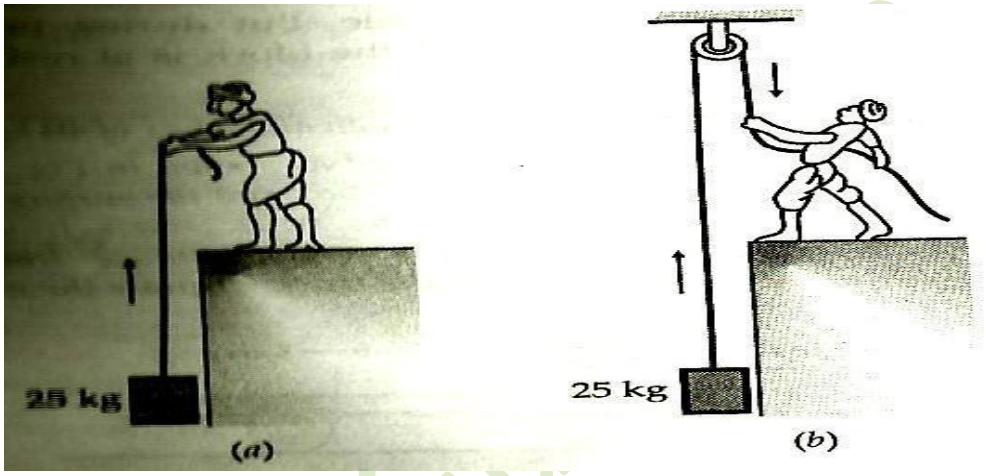
18. What do you mean by error in a measurement? Briefly explain the different type of errors and their causes. How can these errors be minimized?

19. A body travel uniformly distance of (1003.8+0.5) m in a time (4000 + 0.6) s calculate its velocity with error limits. What is percentage error in velocity?

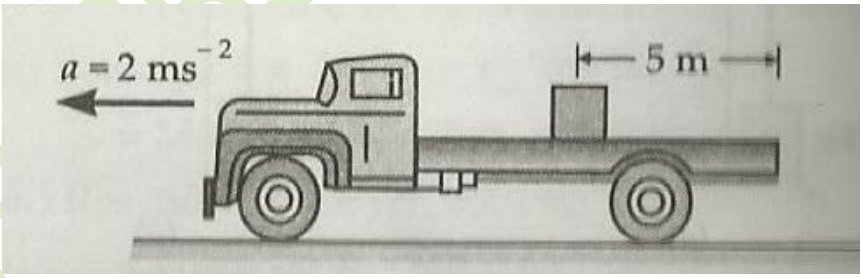
20. A projectile is projected with velocity u making an angle θ with horizontal direction find

(a) Time of flight
(b) Horizontal range.

21. A block of mass 25 kg is raised by a 50 kg man in two different ways as shown. What is the action on the floor by the man in the two cases? If the floor yield to a normal force of 700 N, which mode should the man adopt to lift the block without the floor yielding?



22. The rear side of a truck is open and a box of 40 kg mass is placed 5m away from the open end. The coefficient of friction between the box and the surface below is 0.15m. on a straight road, the truck starts and accelerates with $2m/s^2$. At what distance from the starting point does the box fall of the truck?



23. Krishna went for sightseeing to a nearby river along with his physics teacher. He noticed that the wind was blowing from the side and the sailboat still continued to move forward. He was surprised. He asked his physics teacher the explanation of this situation. The teacher having noticed his interest explained the concept through a small example. The physics of sailing is very interesting in that sailboats do not need the wind to push from behind in order to move. The wind can blow from the side and the sailboat can still move forward. The answer lies in the well-known principle of aerodynamic lift. Imagine you are a passenger in a car as it's moving along, and you

place your right hand out the window. If you tilt your hand in the clockwise sense your hand will be pushed backwards and up. This is due to the force of the air which has a sideways component and upwards component (therefore your hand is pushed backwards and up). (a) What values could you find in Krishna?

24. A ball whose kinetic energy is E, is projected at an angle of 45 to the horizontal. What will be the kinetic energy of the ball at the highest point of its flight.

OR

Show that coefficient of restitution for one dimensional elastic collision is equal to one.

25. Derive an expression for centripetal acceleration of an object in uniform circular motion in a plane. What will be the direction of velocity and acceleration at any instant?

OR

A man moving in rain holds his umbrella inclined to the vertical even though the rain drops are falling vertically downwards why?
Deduce expressions using vector diagrams for velocity and acceleration of an object in uniform circular motion

26. Explain any three methods of reducing friction and what do you understand by ball bearings?
How sliding friction can be converted to rolling friction.

OR

(a) Derive an expression for the work done when a body slides down a rough inclined surface.
(b) Friction is necessary evil. Explain

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