

## PHYSICS

### MODEL QUESTION (PLUS ONE)

- Pick the odd one from the following  
(a) 0.201 (b) 0.0201 (c) 2.01 (d) 0.021 (1)
- Raju conducted an experiment with a common balance and found the mass of the ring to be 2.52g, 2.5g, 2.51g, 2.49g and 2.54g in successive measurements. Calculate  
(a) The mean value of the mass of the ring (1)  
(b) Mean absolute error (1)  
(c) Percentage error (1)
- A person throws a ball upwards with an initial speed of 29.4m/s  
(a) What is the direction of acceleration during the upward motion of the ball (1)  
(b) What is the velocity and acceleration of ball at the highest point (1)  
(c) To what height does the ball rise and after how long does the ball returns to the player's hand (2)
- An ant is moving through a graph paper along x-axis. A boy observes that the ant covers 1mm in every second.  
(a) What type of motion is this (1/2)  
(b) When the boy is in the school bus, he observes the speedometer of the bus. Which speed is observed by the speedometer? (1/2)
- Match the following

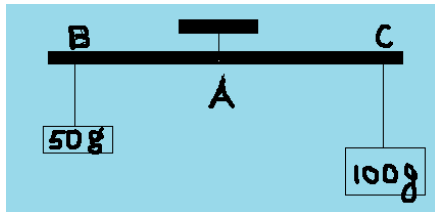
A	B
a. Moment of force	$\tau\Delta\theta$
b. $F\cdot\Delta r$	Linear motion
c. Couple	Torque
d. $\frac{1}{2}I\omega^2$	$\tau\Delta r$
	Rotational motion
	$L^2/2I$

- (2)
- An object is projected with velocity U at an angle  $\theta$  with the horizontal  
(a) What is the path of the motion of the body called? (1)  
(b) Obtain an expression for i) Time taken for its flight (1)  
ii) Maximum height achieved (1)  
iii) Maximum horizontal range (1)

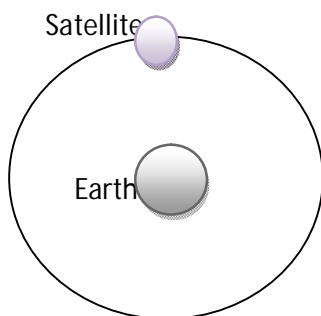
OR

- Parallelogram law helps to find the magnitude and direction of the resultant of two forces. State the law (1)
  - For two vectors A and B are acting at a point with an angle  $\alpha$  between them find the magnitude and direction of the resultant vector. (3)
  - What will be the angle between two vectors of equal magnitude for their resultant to have the same magnitude as one of the vectors? (1)
- While firing a bullet the gun must be held tight to the shoulder  
(a) Which conservation law helps you to explain this? (1)  
(b) 'In firing process the speed of the gun is very low compared to the speed of the bullet' Substantiate the above statement using mathematical expressions. (2)

- (c) A shell of 20Kg moving at 50m/s bursts into two parts of masses 15kg and 5kg. If the larger part continues to move in the same direction at 70m/s, what is the velocity and direction of motion of the other piece? (2)
8. A uniform mass less rod is suspended at A by a string, so that it remains horizontal as shown in figure. A 50g is attached at one side and 100g at the other side.
- (a) Calculate the position of 100g mass if 50g is at a distance of 10cm from the point of suspension. (1)
- (b) In this condition what is the name of A and define it. (1)



- (c) At what distance from a 20g is to be suspended instead of 100g in order to keep the stick horizontal. (1)
9. In taking a catch a cricket player moves his hands backwards on holding the ball Why? (1)
10. Work is required to be done to lift a body from the ground. Let the body be dropped from the height 'h' (a) State the work energy theorem (1)
- (b) Draw graphically the variation of kinetic energy and potential energy with the height of the body. Where do you find
- i) The maximum potential energy
- ii) The maximum kinetic energy (2)
- (c) State and prove the law of conservation of energy in this case. (3)
11. The motion of satellite around earth is shown in figure.
- (a) The minimum velocity required for the satellite to move along the circular path is called ----- (1)
- (b) Obtain an expression for this velocity (2)
- (c) If the satellite is put into an orbit at a height where it has no sufficient velocity for rotation. How will the motion of the satellite be affected? Draw the path of this satellite (2)



OR

Weight of a body is determined by the value of acceleration due to gravity

- (a) What will be the weight of a body at the centre of the Earth (1)
- (b) Explain the variation of acceleration due to gravity with altitude (2)
- (c) At what height the value of g will be half that on the surface (2)

12. When a capillary tube of radius  $r$  is dipped in water, the water rises through it up to a height  $h$ .
- Which of the following is responsible for the above phenomenon?  
i) Viscous force ii) Elastic force iii) Surface tension iv) Gravitational force (1)
  - To what height will water rise in a glass tube with a bore of radius  $0.1\text{mm}$ . S.T of water =  $72 \times 10^{-3}\text{N/m}$ . (2)
  - If the length of the tube is less than the length of capillary rise, will it overflow? Justify your answer. (1)
13. When a metallic sphere falls through coconut oil, its velocity becomes less than that in air
- Name the force which reduces the velocity (1)
  - Derive an expression for the constant velocity attained by a metal ball when it moves through the oil. (2)
14. Minu is standing on the platform of a railway station. She observes that an engine is approaching towards the platform by blowing its siren. She found that the siren of the engine heard by her appears to be shriller than that of an engine receding away from the platform.
- Name this effect (1)
  - Write down the expression for the apparent frequency of the siren heard by her. (1)
  - What change in the apparent frequency will she notice towards a stationary engine while it is blowing the siren? (1)
  - The frequency of the siren of an engine is  $1000\text{Hz}$  and which is moving with a speed of  $72\text{Km/h}$  away from a stationary observer. Determine the apparent frequency heard by the observer if the velocity of sound in air is  $340\text{m/s}$ . (2)
15. A heat engine is a device which converts heat energy into mechanical energy
- State the law which describes this principle (1)
  - Derive an expression for the efficiency of a Carnots engine (3)
  - Find the efficiency of the engine working between ice point and steam point (1)
16. In a thermodynamic process temperature remains constant
- Name the process (1)
  - Derive an expression for the work done during the process (2)
17. (a) When will you say that a motion is simple harmonic (1)
- Derive an expression for velocity and acceleration of a particle executing SHM (3)