RAM	**RAM** (RECALL ALL MEMORY)	26

2 0 2 3 THEORY

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கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர)ப் பரீட்சை, 2023 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2023
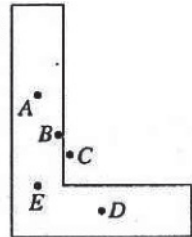
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பௌதிகவியல்   I
Physics   I

Advanced **L**evel Physics
**A**mith Pussella

Multiple Choice Questions

1. Figure shows a thin uniform L-shaped metal sheet. The centre of gravity of the sheet is most likely to be found at the point
   (1) *A*
   (2) *B*
   (3) *C*
   (4) *D*
   (5) *E*

2. If three coplanar forces of $20\,\text{N}$, $40\sqrt{2}\,\text{N}$ and $30\sqrt{2}\,\text{N}$ act on a particle situated at the origin O of a x-y coordinate system as shown in figure, the vector that represents the force necessary to keep the particle stationary is
   (1) *OA*   (2) *OB*
   (3) *OC*   (4) *OD*
   (5) *OE*
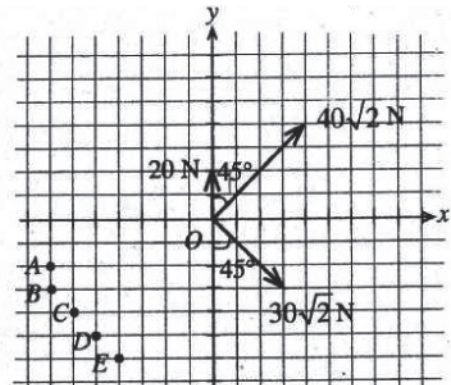
3. A pencil is held vertical on its tip on a frictionless table as shown in the figure. When it is allowed to fall freely towards the +*x*-direction, the path of the centre of gravity of the pencil is best represented by.

(1)   (2)   (3)   (4)   (5)
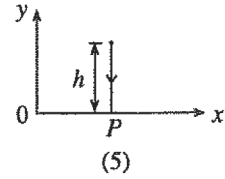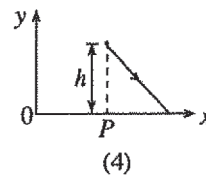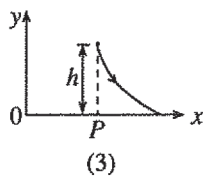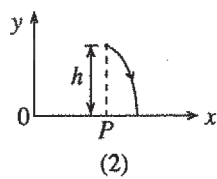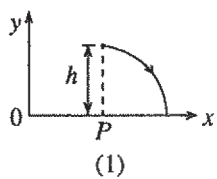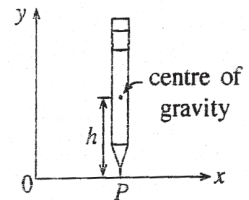
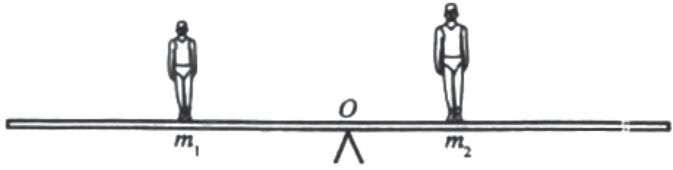**4.** Two children of masses m_1 and m_2 are standing in equilibrium as shown in figure, on a uniform rod which is balanced at its centre of gravity O. Then they start moving simultaneously on the rod at constant speeds v_1 and v_2 respectively while maintaining the horizontal equilibrium of the rod. Consider the following statements made about the motion of the two children. For the equilibrium to be maintained at any time t,


   (A) they should always move in opposite directions.
   (B) they should move keeping their total linear momentum always equal to zero.
   (C) they should move so that the moment produced by one child about O is always equal and opposite to the moment produced by the other child about O.
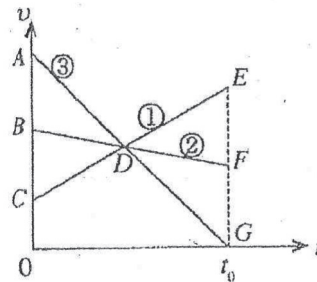
Of the above statements,

(1) only A is true.

(2) only B is true.

(3) only A and B are true.

(4) only B and C are true.

(5) all A, B and C are true.

5. Positions of three motor cars ①, ② and ③ travelling along three parallel straight lanes of a road at time $t = 0$, and $t = t_0$ are shown in figure (a), and their corresponding velocity (v)–time (t) graphs are shown in figure (b).
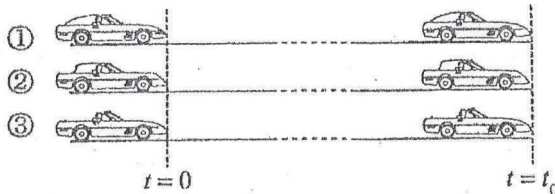
(a)   (b)

The situation shown in figure (a) could have happened only if the areas in the graphs satisfy the conditions

(1) $ABD = DEF$ and $ABD = DEG$
(2) $BCD = DEF$ and $ABD = DFG$
(3) $CDB = DEG$ and $ABD = DEF$
(4) $BCD = ABD$ and $DEF = DFG$
(5) $ACD = DFG$ and $BCD = DFG$

6. An object falling down vertically in air suddenly explodes into four pieces. Which of the following diagrams shows the possible **directions** of motion of the pieces immediately after the explosion? ($\downarrow$ - direction of the object before explosion)

(1)   (2)   (3)   (4)   (5)

7. A cricket ball of mass 0.15 kg travels with a speed of 20 m s^{-1} just before batted by a batsman. When he batted, the variation of the force (F) exerted by the bat on the ball with time (t) is shown in the graph. If the ball bounces back in the opposite direction the speed of the cricket ball just after batting is

(1) 20 m s^{-1} (2) 25 m s^{-1} (3) 65 m s^{-1}
(4) 70 m s^{-1} (5) 110 m s^{-1}
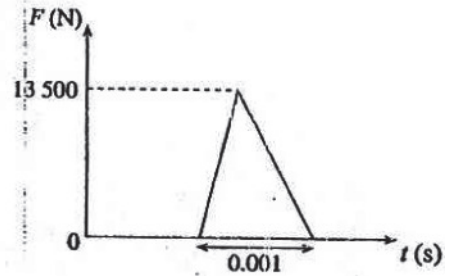
8. Two masses M and m, placed on a frictionless horizontal surface, are connected together as shown in figure using a spring whose mass is negligible. Two masses are first pressed together so that the spring is compressed, and then released. If the initial acceleration of mass m is a, what would be the magnitude of acceleration of mass M at that moment?


(1) $\dfrac{ma}{M+m}$ (2) $\dfrac{Ma}{M+m}$ (3) $\dfrac{ma}{M}$ (4) $\dfrac{Ma}{m}$ (5) $\dfrac{(M+m)a}{m}$

9. A toy in the form of a child-figure holding a section of a thin ring, which carries two identical heavy metal balls, is made from a thin metal sheet as shown in the figure. If the toy can be balanced in stable equilibrium from the toe of the child-figure, most probably the centre of gravity of the system can be found close to a point

(1) P
(2) Q
(3) R
(4) S
(5) T
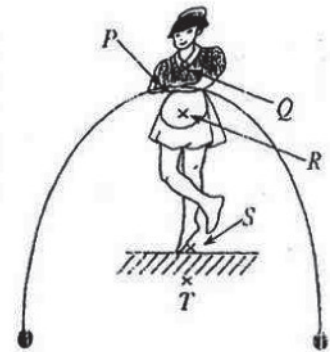
10. Two boys of identical masses are standing on two identical trolleys A and B which are at rest on a frictionless horizontal surface. The boy on trolley A then throws a ball of mass m horizontally with velocity V with respect to the earth and the boy on trolley B catches it. If the mass of a trolley with a boy is M, the respective final velocities of trolleys A and B are
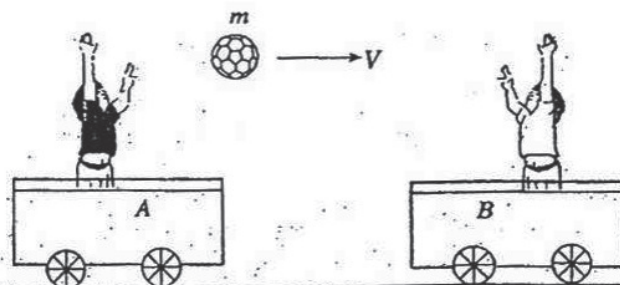
(1) $\dfrac{-mV}{M}$ and $\dfrac{-mV}{M+m}$

(2) $\dfrac{-mV}{M+m}$ and $\dfrac{mV}{M+m}$

(3) $\dfrac{-mV}{M}$ and $\dfrac{mV}{M+m}$

(4) $\dfrac{-mV}{M-m}$ and $\dfrac{mV}{M+m}$

(5) $-V$ and V.