



**Mechanics Mock  
IJSO MCQ mock test  
Solutions**

Mechanics

Question Number	Option				Question Number	Option			
1	A	<del>B</del>	C	D	16	A	<del>B</del>	C	D
2	A	<del>B</del>	C	D	17	A	<del>B</del>	C	D
3	A	<del>B</del>	C	D	18	<del>A</del>	B	C	D
4	A	B	<del>C</del>	D	19	A	<del>B</del>	C	D
5	A	B	C	<del>D</del>	20	A	B	<del>C</del>	D
6	<del>A</del>	B	C	D	21	<del>A</del>	B	C	D
7	A	B	C	<del>B</del>	22	A	B	<del>C</del>	D
8	<del>A</del>	B	C	D	23	A	<del>B</del>	C	D
9	A	B	<del>C</del>	D	24	A	<del>B</del>	C	D
10	A	<del>B</del>	C	D	25	<del>A</del>	B	C	D
11	A	B	<del>C</del>	D	26	A	B	C	<del>D</del>
12	A	<del>B</del>	C	D	27	A	<del>B</del>	C	D
13	A	B	C	<del>D</del>	28	A	B	C	<del>D</del>
14	A	<del>B</del>	C	D	29	<del>A</del>	B	C	D
15	A	B	<del>C</del>	D	30	<del>A</del>	B	C	D

**Question 01 – A simple trick**

↑ Direction

$$v^2 = u^2 + 2as$$

$$s = \frac{v^2 - u^2}{2a} = \frac{2.25^2 - 3.00^2}{2 \times -9.80} = 0.20 \text{ m}$$

The top of the rod is now  $0.20 \text{ m} + 10 \text{ cm} = 0.30 \text{ m} = 30 \text{ cm}$  above the ground while the bottom of the rod is  $0.20 \text{ m} = 20 \text{ cm}$  above the ground.

The height of the light source =  $10.00 \text{ m} - 9.00 \text{ m} = 1.00 \text{ m} = 100 \text{ cm}$  above the ground. This means the light source is  $70 \text{ cm}$  above the top of the rod and  $80 \text{ cm}$  above the bottom of the rod.

Therefore, the position of the top of the rod is  $\frac{70}{80} = \frac{100}{x} \rightarrow x = \frac{800}{7}$ .

The position of the bottom of the rod is  $\frac{80}{80} = \frac{100}{x} \rightarrow x = 100$

The shadow =  $\frac{800}{7} - 100 = \frac{100}{7} = 14.29 \text{ cm}$

Correct answer is **B**

**Question 02 – A ball falling through a slit**

$$S = 4\pi r^2 \rightarrow r = \sqrt{\frac{S}{4\pi}} = \sqrt{\frac{100 \text{ cm}^2}{4\pi}} = 2.821 \text{ cm}$$

$$\text{Diameter} = 5.642 \text{ cm}$$

The minimum and maximum horizontal distance the ball drops are  $16.8 + d = 22.442$  cm and  $16.8 + 9.2 = 26.0$  cm.

$$\downarrow \text{ Direction } s = \frac{1}{2}gt^2$$

$$t = \sqrt{\frac{2s_{\downarrow}}{g}}$$

→ Direction

$$\text{Time taken} = \frac{s_{\rightarrow}}{v} = \frac{0.2}{v}$$

$$v_{\max} = \frac{s_{\rightarrow}}{t_{\min}} = \frac{0.200}{\sqrt{\frac{2 \times 0.22442}{9.80}}} = 0.935 \text{ ms}^{-1}$$

$$v_{\min} = \frac{s_{\rightarrow}}{t_{\max}} = \frac{0.200}{\sqrt{\frac{2 \times 0.260}{9.80}}} = 0.868 \text{ ms}^{-1}$$



Correct answer is **B**.

**Question 03 – An Inelastic Collision**

Momentum is conserved. Since it is a perfectly inelastic collision, the two blocks stick together and move in the same direction with the same speed.

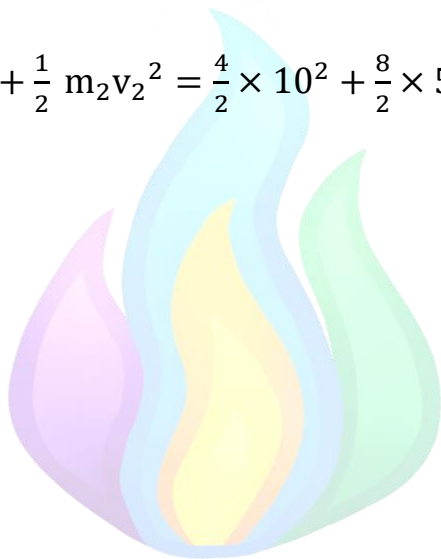
$$m_1v_1 + m_2v_2 = (m_1 + m_2)v_f$$

$$v_f = \frac{m_1v_1 + m_2v_2}{m_1 + m_2} = \frac{4 \times 10 + 8 \times -5}{4 + 8} = 0$$

Final energy = 0 J

$$\text{Initial energy} = \frac{1}{2} m_1v_1^2 + \frac{1}{2} m_2v_2^2 = \frac{4}{2} \times 10^2 + \frac{8}{2} \times 5^2 = 300 \text{ J}$$

The correct answer is **B**.



**Question 04 – An Adventure on Venus**

To suck liquid up, the pressure difference must be equal to the hydrostatic pressure.

$$\Delta P = \rho gh$$

$$\Delta P = 17000 \times 8.87 \times 1.00 = 150790 \text{ Pa} = \frac{150790 \text{ Pa}}{101325 \text{ Pa/atm}} = 1.49 \text{ atm}$$

The internal lung pressure should be 1.49 atm lower than the atmospheric pressure.

Therefore, the lung pressure is  $90 - 1.49 = + 88.51 \text{ atm}$ .

Correct answer is **B**



**Question 05 – Hanging Mass**

$$F_1 \sin \alpha + F_2 \sin \beta = mg = 9.8 \times 10 = 98 \text{ - Equation 01}$$

$$F_1 \cos \alpha = F_2 \cos \beta \text{ - Equation 02}$$

From equation 02,

$$F_2 = \frac{F_1 \cos \alpha}{\cos \beta}$$

Substituting to Equation 1,

$$F_1 \sin \alpha + F_1 \cos \alpha \tan \beta = 98$$

Dividing both sides by  $\cos \alpha$ ,

$$F_1 \tan \alpha + F_1 \tan \beta = \frac{98}{\cos \alpha}$$

$$\cos \alpha = \frac{98}{F_1 (\tan \alpha + \tan \beta)} = \frac{98}{21.71 \times 5.329} = 0.8471$$

$$\alpha = 32.10^\circ$$

$$\beta = 78.00^\circ$$

$$F_2 = \frac{21.71 \cos \alpha}{\cos \beta} = 88.46 \text{ N}$$

Correct answer is **D**

**Question 06 – Physics in Chemistry**

If we assume that the volume of concentrated sulfuric acid is  $V$ , the volume of water is  $10 V$ .

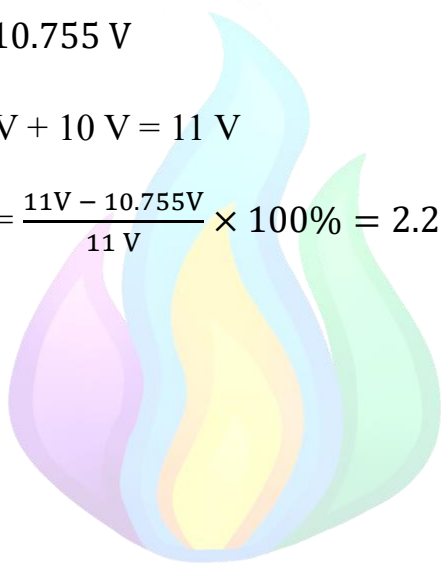
$$\text{Mass is } 1.83 \times V + 1.00 \times 10V = 11.83 V$$

$$\text{Final volume} = \frac{11.83 V}{1.10} = 10.755 V$$

$$\text{Predicted final volume} = V + 10 V = 11 V$$

$$\text{Percent volume decrease} = \frac{11V - 10.755V}{11 V} \times 100\% = 2.23\%$$

Correct answer is **A**



**Question 07 – Launching a Block**

For the 10 kg block,

$$a = g \sin \theta + \mu g \cos \theta = 9.80 \sin 30^\circ + 0.2 \times 9.8 \cos 30^\circ = 6.60 \text{ ms}^{-2}$$

$$v^2 = u^2 - 2as \Rightarrow v = \sqrt{u^2 - 2as} = \sqrt{10^2 - 2 \times 6.60 \times 4} = 6.870 \text{ ms}^{-1}$$

Since the reaction is elastic, both momentum and energy are conserved.

$$\text{Momentum conservation: } 5v_1 - 10v_2 = 6.870 \times 10 = 68.70$$

$$\text{Energy conservation: } 2.5 v_1^2 + 5v_2^2 = 5 \times 6.870^2 = 235.9845$$

Solving the simultaneous equations, we get  $v_1 = 9.16 \text{ ms}^{-1}$

Therefore, the smaller ball moves up with a velocity of  $9.16 \text{ ms}^{-1}$

$$a = g \sin \theta + \mu g \cos \theta = 9.80 \sin 30^\circ + 0.3 \times 9.8 \cos 30^\circ = 7.45 \text{ ms}^{-2}$$

$$v^2 = u^2 - 2as \Rightarrow v = \sqrt{u^2 - 2as} = \sqrt{9.16^2 - 2 \times 7.45 \times 2} = 7.356 \text{ ms}^{-1}$$

When the spring has a maximum compression, the elastic potential energy + the gain in gravitational potential energy equals the initial kinetic energy minus the work done by the friction force (technically plus, since the work is negative)

$$\frac{1}{2} mv^2 - \mu mgx \cos 30^\circ = \frac{1}{2} kx^2 + mgx \sin 30^\circ$$

$$\text{Substituting numerical values, } 25x^2 + 37.23 x - 135.3 = 0$$

Solving for x, we get  $x = 3.19 \text{ m}$

Correct answer is **D**.

**Question 08 – A Metal Bar**

The distance to the centre of mass from the centre of AM is 0.296 L.

The distance to the centre of mass from the centre of MB is 0.204 L.

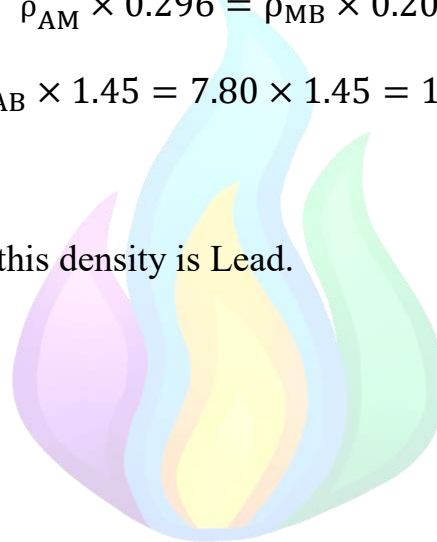
Balancing the moment around the centre of mass, since the volume of both AM section and MB section is constant,

$$\rho_{AM} \times 0.296 = \rho_{MB} \times 0.204$$

$$\rho_{MB} = \rho_{AB} \times 1.45 = 7.80 \times 1.45 = 11.31 \text{ g/cm}^3$$

The answer that matches this density is Lead.

Correct answer is **A**



**Question 09 – A Block on the Train**

$$a = 7 - \mu g$$

$$s = ut + \frac{1}{2}at^2$$

Since  $u = 0$ ,

$$a = \frac{2s}{t^2} = \frac{2 \times 36}{6^2} = 2 \text{ ms}^{-2}$$

$$\mu g = 7 - a = 7 - 2 = 5 \text{ ms}^{-2}$$

$$\mu = \frac{5}{9.8} = 0.510$$

Correct answer is **C**



**Question 10 – Pushing a Block**

$$f_s \leq \mu_s N$$

Therefore, the limiting friction is;

$$f_{s,\max} = 0.8 \times (5 \times 9.8)$$

$$f_{s,\max} = 39.2 \text{ N}$$

Since the limiting frictional force is greater than the applied force ( $39.2 \text{ N} > 30 \text{ N}$ ), the frictional force will be equal to the applied force in magnitude.

Therefore, frictional force = 30 N

Because the forces are in equilibrium (that is, the net force is 0), there is no acceleration.

Therefore, acceleration = 0

Correct answer is **B**

**Question 11 – Car Racing**

$$v = \frac{d}{t} = \frac{2\pi R}{t}$$

$$F_c = \frac{mv^2}{R} = F_\mu = \mu_s mg$$

$$\mu_s = \frac{v^2}{Rg} = \frac{(2\pi R/t)^2}{Rg} = \frac{4\pi^2 R}{t^2 g} = \frac{4\pi^2 \times 50}{30^2 \times 9.80} = 0.224$$

Correct answer is **C**



**Question 12 – Efficiency of an Engine**

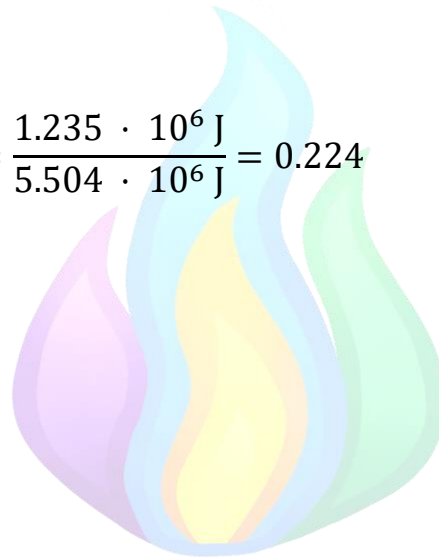
$$\Delta E = \frac{1}{2}m(v_2^2 - v_1^2) = \frac{1}{2} \times 800 \times \left( \left( \frac{250}{3.6} \right)^2 - \left( \frac{150}{3.6} \right)^2 \right)$$

$$\Delta E = 1.235 \cdot 10^6 \text{ J}$$

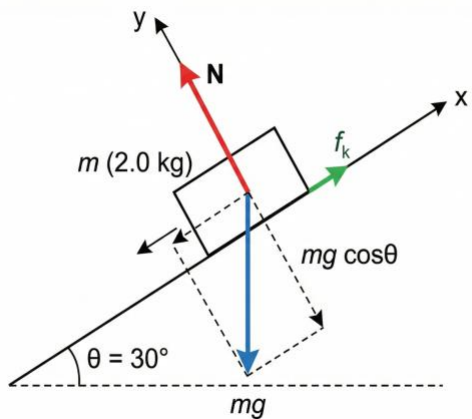
$$\text{Fuel energy input} = \frac{32}{1000} \times 43 \times 10^6 \times 4 = 5.504 \cdot 10^6 \text{ J}$$

$$F = \frac{\Delta E}{\text{Fuel energy input}} = \frac{1.235 \cdot 10^6 \text{ J}}{5.504 \cdot 10^6 \text{ J}} = 0.224$$

Correct answer is **B**



### Question 13 – Block Sliding Down a Ramp



$$f_k = \mu_k N$$

$$mg \cos \theta = 16.97 \text{ N and } mg \sin \theta = 9.8 \text{ N}$$

The normal reaction force is equal to the component of gravity acting directly perpendicular to the surface, which is  $mg \cos \theta$ . Therefore  $N = 16.97 \text{ N}$

$$f_k = 0.2 \times 16.97 \approx 3.4 \text{ N}$$

$$\text{Therefore, } F_{\text{net}} = 9.8 - 3.4 = 6.4 \text{ N}$$

Plugging in this value into  $F = ma$  we get,  $a = 3.2 \text{ ms}^{-2}$

$$s = ut + \frac{1}{2}at^2 \rightarrow s = \frac{1}{2}at^2 \quad (\text{Since initial velocity is zero})$$

$$s = \frac{5}{\sin 30^\circ}$$

$$\text{Therefore, } 10 = \frac{1}{2}3.2 \times t^2$$

Subjecting  $t$ , we get,

$$t \approx 2.50 \text{ s}$$

Correct answer is **D**.

**Question 14 – Block Going up the Ramp**

In the question, it is given that the efficiency of an inclined plane is the minimum work required to lift an object at a height  $h$  divided by the work done to lift the object from the base of the plane to the same height  $h$  (against weight and friction).

Minimum work required to lift an object at a height  $h$ ;

$$W = mgh$$

$$W = 2 \times 9.8 \times 5$$

$$W = 98 \text{ J}$$

Work done to lift the object from the base of the plane to the same height  $h$ ;

$$W = Fs$$

Here the force required is to oppose the component of weight and friction;

$$F = 9.8 + 3.4 = 13.2 \text{ N}$$

$$W = 13.2 \times 10 = 132 \text{ N}$$

Therefore the efficiency is,

$$\text{Efficiency} = \frac{98}{132} \times 100\% = 74.3\%$$

Correct answer is **B**

**Question 15 – Two Blocks being Held Up**

By balancing the forces in the vertical direction, you could see that

$$F_2 + 60 = F_1$$

Now, when we balance the torque around the center of mass of the white block, we obtain

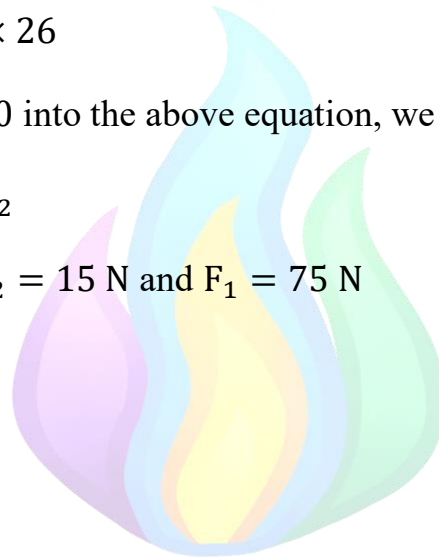
$$24 \times 10 + F_1 \times 2 = F_2 \times 26$$

Substituting  $F_1 = F_2 + 60$  into the above equation, we get

$$240 + 120 + 2F_2 = 26F_2$$

Solving this, we obtain  $F_2 = 15 \text{ N}$  and  $F_1 = 75 \text{ N}$

Correct answer is **C**



**Question 16 – A Sinking Cube**

Finding the density of aluminum,

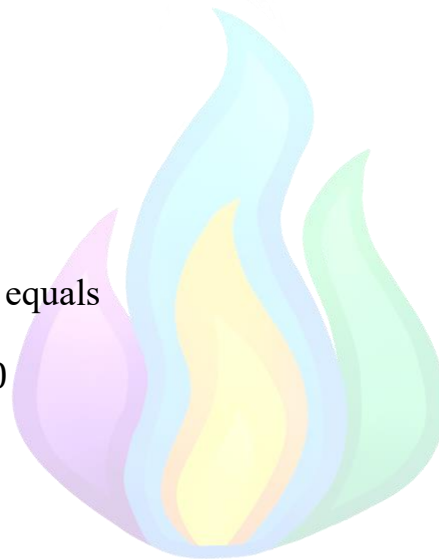
$$\rho = \frac{m}{V} = \frac{2700 \text{ g}}{(10)^3} = 2.7 \text{ g/cm}^3$$

From Archimedes' upthrust law, we can say that the height of the cube inside the liquid,  $h$ , is

$$h = \frac{2.7}{\rho} \times 10$$

The volume of liquid lost equals

$$V = 10^2 h = 100h = 300$$



Therefore,

$$h = 3 \text{ cm and as a percentage this is 30\%}$$

We could also find the density as follows:

$$\rho = \frac{2.7 \times 10}{3} = 9 \text{ g/cm}^3$$

Correct answer is **B**

**Question 17 – Dragos and Tarnovanu**

The velocity of the ball relative to a line parallel to the ground is  $30 \cos 30^\circ = 25.98 \text{ ms}^{-1}$  and this velocity is constant because there is no acceleration.

Therefore, the x-axis speed of the football is  $25.98 \cos 50^\circ = 16.70 \text{ ms}^{-1}$

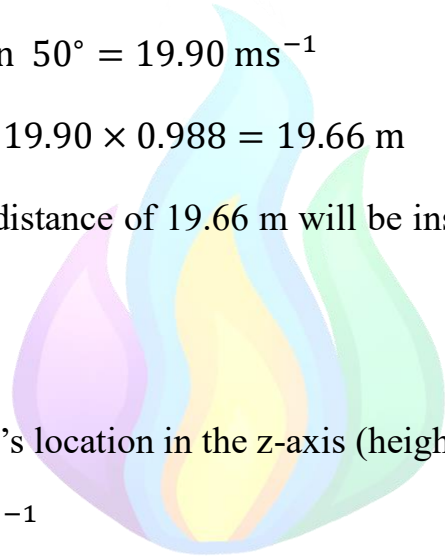
This means the ball takes  $\frac{16.5}{16.7} = 0.988$  seconds to cover a x-axis distance of 16.5 m.

Now, let's look at the ball's location in the y-axis

Y-axis velocity:  $25.98 \sin 50^\circ = 19.90 \text{ ms}^{-1}$

Y-axis distance travelled:  $19.90 \times 0.988 = 19.66 \text{ m}$

We can see that a y-axis distance of 19.66 m will be inside the goal. Therefore, the ball won't go too wide.



Now, let's look at the ball's location in the z-axis (height)

$u = v_0 \sin 30^\circ = 15 \text{ ms}^{-1}$

Applying  $s = ut + \frac{1}{2}at^2$  to  $\uparrow$  direction, we obtain

$$s = 15 \times 0.988 + \frac{1}{2} \times (-9.80) \times 0.988^2 = 10.04 \text{ m}$$

Therefore, we can conclude that this ball won't go wide but in fact will go way too high for the goal. This would have been a good kick had it been in rugby!

Correct answer is **B**

**Question 18 – A Car Crash**

Here, we apply the principle of conservation of linear momentum.

Since the truck and the car stick together after the collision, this is an inelastic collision. Here we will define the direction of the motion of the truck as positive, and therefore the truck has a velocity of  $15 \text{ ms}^{-1}$  while the car has a velocity of  $20 \text{ ms}^{-1}$  as the car moves in the opposite direction (Note that the positive and negative directions can be decided as desired).

$$\text{Momentum of the truck: } P_t = m_t v_t = 1200 \times 15 = 18000 \text{ kgms}^{-1}$$

$$\text{Momentum of the car: } P_c = m_c v_c = 800 \times -20 = -16000 \text{ kg ms}^{-1}$$

$$\text{Total momentum before collision; } P_t = 18000 + (-16000) = 2000 \text{ kg ms}^{-1}$$

Since momentum is conserved, the final momentum after the collision is also the same.

$$P_f = m_f v_f = 2000 \text{ kg ms}^{-1}$$

Since the truck and car stay together after the collision, the final mass will be

$$800 + 1200 = 2000 \text{ kg}$$

$$2000 \times v_f = 2000 \text{ kg ms}^{-1}$$

$$v_f = 1 \text{ ms}^{-1}$$

Correct answer is **A**

**Question 19 – Swinging a Ball**

The position where the tension will be maximum is the bottommost point of the circular path, as the weight acts completely opposite to the tension at that point.

The velocity at that point;

$$F_C = T - mg$$

(As the weight acts directly opposite to the tension)

$$F_C = 300 - 2 \times 9.8 = 280.4 \text{ N}$$

$$F_C = \frac{mv^2}{r}$$

$$F_C = \frac{2 \times v^2}{2}$$

$$F_C = v^2$$

$$v = \sqrt{280.4}$$

$$v = 16.75 \text{ ms}^{-1}$$

Correct answer is **B**



**Question 20 – La Vacca Terra Terrisima**

$$g = \frac{GM}{R^2}$$

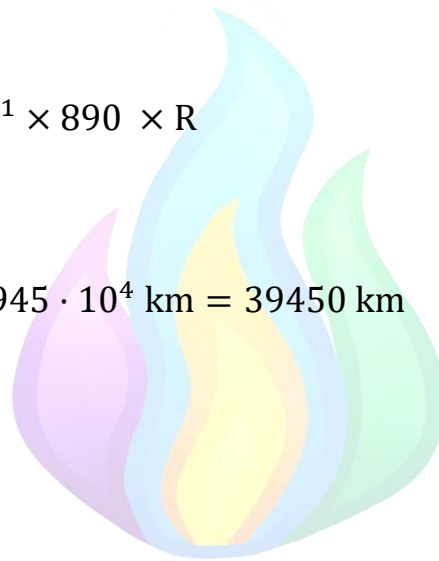
$$M = \frac{4}{3}\rho R^3$$

$$g = \frac{4}{3}G\rho R$$

$$9.81 = \frac{4}{3}\pi \times 6.67 \cdot 10^{-11} \times 890 \times R$$

$$R = 3.945 \cdot 10^7 \text{ m} = 3.945 \cdot 10^4 \text{ km} = 39450 \text{ km}$$

Correct answer is **C**



## Question 21 – Making an Approximation

We can solve this very easily by using

$$v \times s = V \times S$$

$$\frac{V}{v} = \frac{s}{S} = \frac{1 \text{ cm}^2}{1 \text{ m}^2} = 1 \times 10^{-4}$$

Correct answer is **A**



**Question 22 – Throwing a Ball**

Here we use the equation;  $s = ut + \frac{1}{2}at^2$

$$u = 10 \text{ ms}^{-1}$$

$$s = -20 \text{ m}$$

$$a = -10 \text{ ms}^{-2}$$

Rearranging the equation we get;

$$5t^2 - 10t - 20 = 0$$

Solving this quadratic equation we get:

$$t \approx -1.236 \text{ or } t \approx 3.236$$

Since the time interval is a positive value.

$$t \approx 3.236$$

$$t \approx 3 \text{ s}$$

Correct answer is **C**

**Question 23 – The Asteroid Belt**

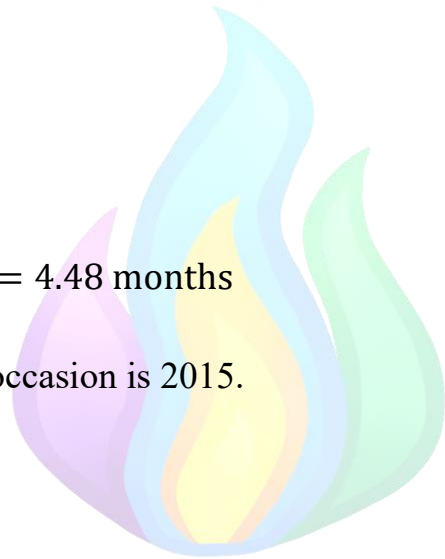
This happens again when the Earth completes one whole rotation and moves a further  $\theta$  angle. Suppose the time (in years) it takes for the next occasion is  $x$  years. At this point, the Earth has completed one full rotation and a further  $\theta$  angle while the asteroid only moved the  $\theta$  angle. Using this information, we could write the equation

$$\frac{x}{3.68} = \frac{x - 1}{1}$$

$$x = \frac{1}{2.68} = 0.373 \text{ years} = 4.48 \text{ months}$$

So, you can see the next occasion is 2015.

Correct answer is **B**



**Question 24 – A Launcher**

Potential Energy at maximum compression =

$$\frac{1}{2}kx^2 = \frac{1}{2} \times 55 \times 0.3^2 = 2.475 \text{ J}$$

Potential Energy at the second point =

$$\frac{1}{2}kx^2 = \frac{1}{2} \times 55 \times 0.1^2 = 0.275 \text{ J}$$

Energy lost due to friction =

$$\mu_k mgd = 0.5 \times 0.9 \times 9.8 \times (0.3 - 0.1) = 0.882 \text{ J}$$

Kinetic energy at the end according to Energy conservation,

$$2.475 \text{ J} - 0.275 \text{ J} - 0.882 \text{ J} = 1.318 \text{ J}$$

$$E = \frac{1}{2}mv^2$$

$$v = \sqrt{\frac{2E}{m}} = \sqrt{\frac{2 \times 1.318}{0.9}} = 1.71 \text{ ms}^{-1}$$

Correct answer is **B**

**Question 25 – Motion of a Boat**

Let's analyze each option.

A. Kinetic energy is proportional to  $v^2$ . In this case,  $v^2 \propto (e^{-\frac{k}{m}t})^2 = e^{-2\frac{k}{m}}$ .

Therefore, statement A is wrong.

B. When  $t = 0$ ,  $v = Ae^0 = A$ . Therefore, statement B is correct.

C.  $a = \frac{F}{m} = \frac{-kv}{m} = \frac{-kAe^{-\frac{k}{m}t}}{m} = -A\frac{k}{m}e^{-\frac{k}{m}t}$ . Therefore, statement C is correct.

D. This is true because there is a limit to this mathematical model. Therefore, statement D is correct.

Correct answer is **A**



### Question 26 – The battle of Borodino

The range is given by  $r = \frac{v_0^2 \sin(2\theta)}{g}$ , where  $v_0$  is the launching speed and  $\theta$  is the launching angle. This equation is easily derivable from analyzing the motion on the two individual axes and using  $2\sin\theta\cos\theta = \sin(2\theta)$ . Naturally, the range is maximum when  $\sin(2\theta)$  is maximum, i.e.  $2\theta = 90^\circ$ ,  $\theta = 45^\circ$ , which gives  $r_{\max} = \frac{v_0^2}{g}$ , so  $v_0^2 = r_{\max}g$ .

Hitting the target means  $3\text{km} < r < 8\text{km}$ . Since the range is smaller than 5km anyways, the only condition is  $r > 3\text{km} = r_{\min}$ .

When increasing the launching angle, the range increases from  $r(0^\circ) = 0$ , gets to  $r(\theta_1) = r_{\min} = 3\text{km}$ , continues increasing until  $r(45^\circ) = 5\text{km}$  and then starts decreasing again until it hits  $r(\theta_2) = r_{\min} = 3\text{km}$  and at last it becomes  $r(90^\circ) = 0$ .

The cannon will hit the target if  $\theta_1 < \theta < \theta_2$ . In order to find these angles:

$$r_{\min} = \frac{v_0^2 \sin(2\theta_{1,2})}{g} = r_{\max} \sin(2\theta_{1,2}), \text{ so } \sin(2\theta_{1,2}) = \frac{r_{\min}}{r_{\max}} = 0.6.$$

Since  $0^\circ < 2\theta_{1,2} < 180^\circ$ , this equation has two solutions:

$$2\theta_1 = \arcsin(0.6) = 36.9^\circ, \theta_1 = 18.4^\circ$$

$$2\theta_2 = 180^\circ - \arcsin(0.6) = 143.1^\circ, \theta_2 = 71.6^\circ$$

Correct answer is **D**

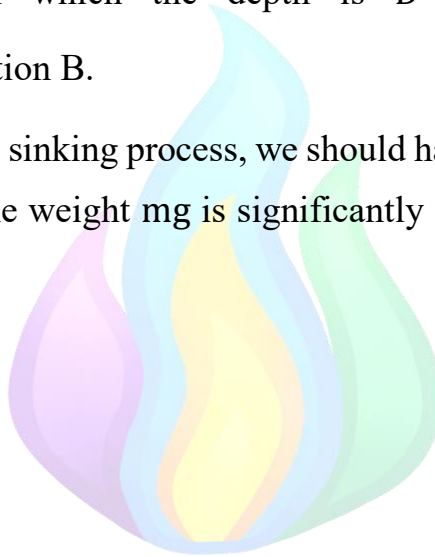
**Question 27 – The battle of Borodino Again**

Using the solution from Question 26,  $v_0^2 = r_{\max}g$ . Since the cannonball is launched from ground level and hits the ground at the same level, the gravitational potential energy does not change - weight does no net work. That means, just before hitting the ground, the cannonball has the same velocity as the launch one. We can then write:

$\frac{1}{2}mv_0^2 - F_r D = 0$ , from which the depth is  $D = \frac{\frac{1}{2}mr_{\max}g}{F_r} = 2.45\text{m}$ , which corresponds to answer option B.

(Note: Technically, for the sinking process, we should have taken the work of weight into account. However, the weight  $mg$  is significantly smaller than  $5 \cdot 10^4\text{N}$ , so its effect is negligible)

Correct answer is **B**



### Question 28 – A Trajectory

The runner's shoes move up and hit the ground in a circular motion, so we could exclude options A and C. The runner's shoe doesn't travel below the ground; therefore, we could exclude options B.

Correct answer is **D**



**Question 29 – Rotational Energy**

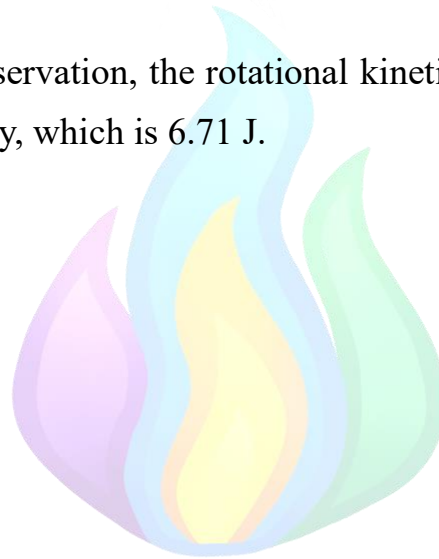
Using the cosine rule, we can find the length of the red wire

$$\sqrt{1^2 + 1^2 - 2 \times 1 \times 1 \times \cos 30^\circ} = 0.518 \text{ m}$$

$$\text{Elastic potential energy} = \frac{1}{2} kx^2 = \frac{1}{2} \times 50 \times 0.518^2 = 6.71 \text{ J}$$

According to energy conservation, the rotational kinetic energy should be equal to the elastic potential energy, which is 6.71 J.

Correct answer is **A**



**Question 30 – A Delicate Equilibrium**

The torque acting on the centre of the rod is

$$5Mg \times 1.5 - 3Mg \times 1.5 = 3Mg \text{ clockwise.}$$

Therefore, the weight of the rod must exert a  $3Mg$  anticlockwise torque around the centre of the mass.

$$6Mgd = 3Mg$$

$$d = 0.50 \text{ m}$$

Therefore, the centre of mass of the rod should be  $0.5 \text{ m}$  to the left of its centre. But the centre of mass of the rod cannot be to the left of the leftmost point of the rod.

Correct answer is **A**

