AP EAMCET Physics Practice Questions

1. During peddling of a bicycle, the force of friction exerted by the ground on the two wheels is such that it acts

(a) in the backward direction on the front wheel and the forward direction on the rear wheel

(b) in the forward direction on the front wheel and the backward direction on the rear wheel

(c) in the backward direction on both, the front and the rear wheels

(d) in the forward direction on both, the front and the rear wheels.

Answer: (a) Due to peddling, the point of contact of the rear wheel tends to move backwards. So frictional force opposes the backwards tendency i.e., the frictional force acts in the forward direction. But the back wheel accelerates the front wheel in the forward direction. To oppose this frictional force acts in the backward direction on the front wheel.

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2. A horizontal force of 10 N is necessary to just hold a block stationary against a wall. The coefficient of friction between the block and the wall is 0.2. The weight of the block is-

(a) 20 N

(b) 50 N

(c) 100 N

(d) 2 N

Solution

Frictional force balances the weight of the body

Frictional force $f = \mu N = mg$

$f = 0.2 \times 10 = 2N$

Therefore, the weight of the block $mg = 2N$

Answer: (d) 2N

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3. A marble block of mass 2 kg lying on ice when given a velocity of 6 m/s is stopped by friction in 10s. Then the coefficient of friction is (consider g =10m/s)

(a) 0.02

(b) 0.03

(c) 0.06

(d) 0.01

Solution

u = 6 m/s

v = 0

t =10s

a = -f/m = – μmg/m = – μg = -10μ

Substituting values in v = u+at

0 = 6 – 10μ x 10

Therefore, μ = 0.06

Answer: (c) 0.06

4.

This question has Statement 1 and Statement 2. Of the four choices given after the statements, choose the one that best describes the two statements.

If two springs S1 and S2 of force constants k1 and k2, respectively, are stretched by the same force, it is found that more work is done on spring S1 than on spring S2.

Statement-1: If stretched by the same amount, work done on S1, will be more than that on S2

Statement-2 :k1 < k2

(a) Statement-1 is True, Statement-2 is true and Statement-2 is not the correct explanation of Statement-1.

(b) Statement-1 is False, Statement-2 is true

(c) Statement-1 is True, Statement-2 is false

(d) Statement-1 is True, Statement-2 is true and Statement-2 is the correct explanation of statement-1.

Solution

Given same force F = k1x1 = k2x2

k1/k2 = x1/x2

W1 = ½ k1x12 and W2=½ k2x22

As W1/W2 ＞1 so [½ k1x12/ ½ k2x22]＞1

Fx1/Fx2＞1 ⇒ k2//k1＞1

Therefore k2 ＞ k1 Statement-2 is true

Or if x1 = x2 = x

W1/W2 = ½ k1x2 / ½ k2x2

W1/W2 = k1/ k2 ＜1

W1 ＜W2 , Statement-1 is False

Answer: (b) Statement-1 is False, Statement-2 is true

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5. The upper half of an inclined plane with inclination Φ is perfectly smooth, while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom of the coefficient of friction for the lower half is given by

(a) 2 sinΦ

(b) 2 cosΦ

(c) 2 tanΦ

(d) tanΦ

Solution

Suppose the length of the plane is L. When the block slides down the plane, the increase in the K.E will be equal to the decrease in the P.E

Work done, W = Change in K.E (ΔK) = (1/2) mu2 – (1/2)mv2= 0

Work done by friction (Wf) + Work done by gravity (Wg) = 0

$-\mu g\cos\Phi(L/2) + mgL\sin\Phi = 0$

$\Rightarrow (\mu/2)\cos\Phi = \sin\Phi$

$\Rightarrow \mu = 2\tan\Phi$

Answer: (c) $2\tan\Phi$

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6. Consider a car moving on a straight road with a speed of 100 m/s. The distance at which a car can be stopped is : ($\mu k = 0.5$)

(a) 800 m

(b) 1000 m

(c) 100 m

(d) 400 m

Solution

When the car is stopped by friction then its retarding force is

$ma = \mu R$

$ma = \mu mg$

$a = \mu g$

Consider the equation $v2 = u2 - 2as$ (the car is retarding so a is negative)

$0 = u2 - 2as$

$2as = u2$

$s = u2/2a$

s = u2/2μg

s = (100)2/2 x 0.5 x 10

s = 1000 m

Answer: (b) 1000

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7. If a machine is lubricated with oil

(a) the mechanical advantage of the machine increases
(b) the mechanical efficiency of the machine increases
(c) both its mechanical advantage and efficiency increase
(d) its efficiency increases, but its mechanical advantage decreases.
Answer.(b) When a machine is lubricated with oil friction decreases. Hence the mechanical efficiency of the machine increases.

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8. A particle undergoes uniform circular motion. About which point on the plane of the circle, will the angular momentum of the particle remain conserved?

- centre of the circle
- on the circumference of the circle
- inside the circle
- outside the circle
- Solution

The force will pass through the centre of the circle. Therefore, the angular momentum will remain conserved at the centre of the circle.
Answer: (1) centre of the circle

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9. A passenger train of length 60 m travels at a speed of 80 km/hr. Another freight train of length 120 m travels at a speed of 30 km/hr. The ratio of times taken by the passenger train to completely cross the freight train when: (i) they are moving in the same direction, and (ii) in the opposite direction, is

(a) 25/11

(b) 3/2

(c) 5/2

(d) 11/5

Solution:

The total distance to be travelled by train is 60 + 120 = 180 m.

When the trains are moving in the same direction, the relative velocity is v1 – v2 = 80 – 30 = 50 km hr–1.

So time taken to cross each other, t1 = 180/(50 x 103/3600) = [(18 x 18)/25] s

When the trains are moving in the opposite direction, the relative velocity is |v1 – (–v2)| = 80 + 30 = 110 km hr–1

So time taken to cross each other

t2= 180/(110 x 103/3600) = [(18 x 36)/110] s

t1/t2= [(18 x 18)/25] / [(18 x 36)/110] = 11/5

Answers: (d) 11/5

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10. A musician using an open flute of length 50 cm produces second harmonic sound waves. A person runs towards the musician from another end of a hall at a speed of 10 km/h. If the wave speed is 330 m/s, the frequency heard by the running person shall be close to

(a) 666 Hz

(b) 753 Hz

(c) 500 Hz

(d) 333 Hz

Solution

The frequency of the sound produced by the open flute

f=2(v/2l) = (2 x 330)/(2 x 0.5) = 660 Hz

Velocity of observer, v0 = 10 x (5/18) = (25/9) m/s

As the source is moving towards the observer, according to the Doppler effect.

The frequency detected by an observer

f’ = {(v + v0)/v}f = {((25/9) + 330)/330}660

= 2 ((25/9) + 330)

f’ = 665.55 ≈ 666 Hz

Answer: (a) 666 Hz
