AL Physics MC Answers

Year:1995

Question Number: 1,4,15,19,21,23,25,27,31,38,39,42

1995MC (1)

$mg\sin\theta$ = friction. …… (1)

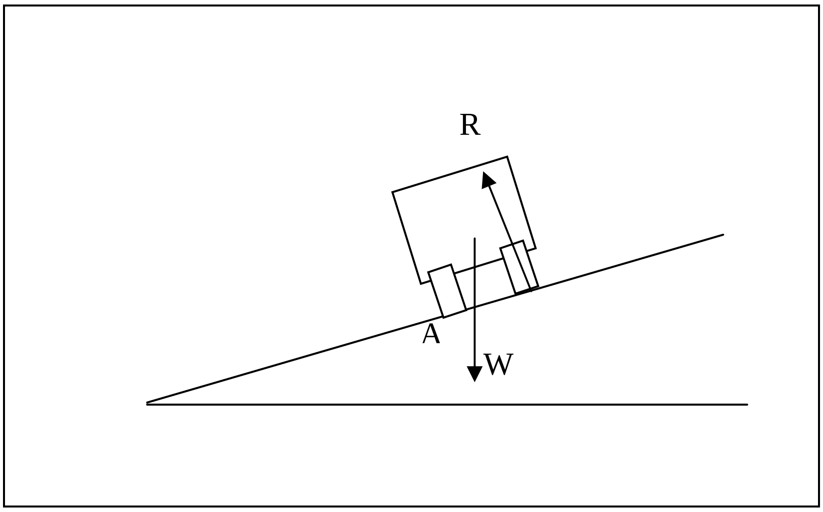
To pull the car up the inclined plane, it is required to balance two forces, $mg\sin\theta$ and friction, since both are acting down along the inclined plane.

Because of (1)

Force = $mg\sin\theta$ + friction = $2mg\sin\theta$

1995MC (4)

(a) The car is safe, it will not overturn.



W: weight of the car

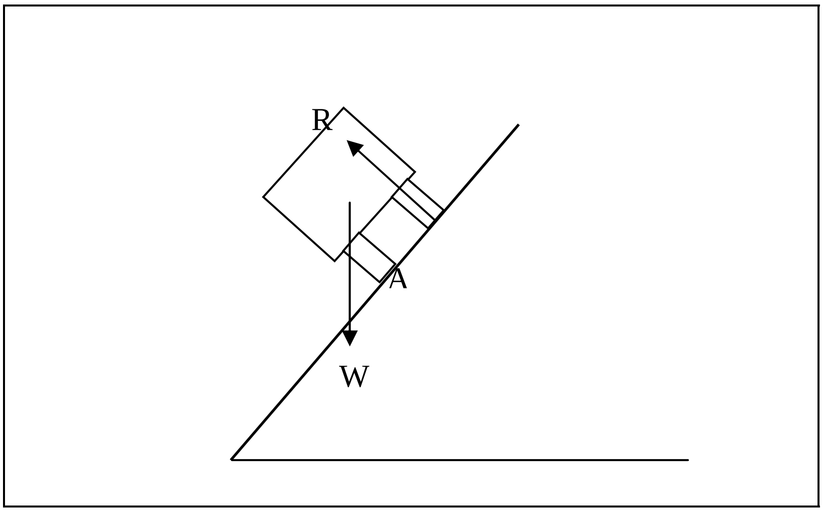
R: normal reaction force at the upper wheel

Take moment about A (the bottom of the lower wheel),

clockwise moment produced by W = anticlockwise moment produced by R

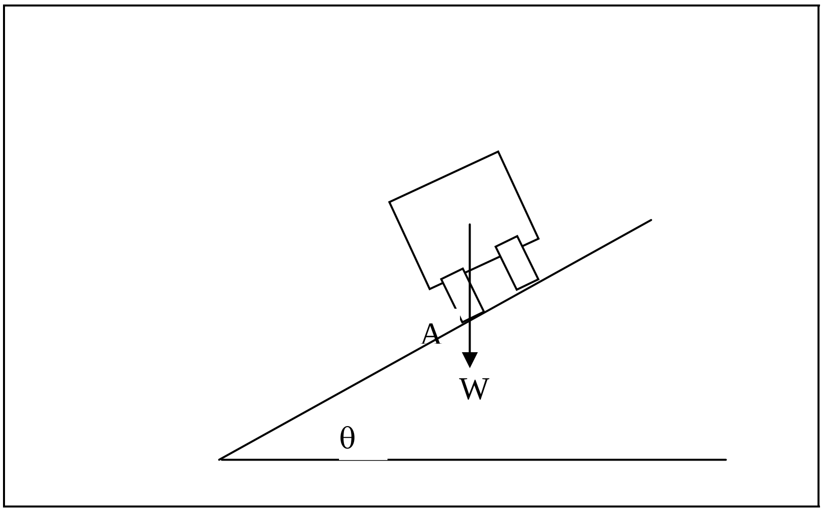
Equilibrium is achieved.

(b) The car will overturn



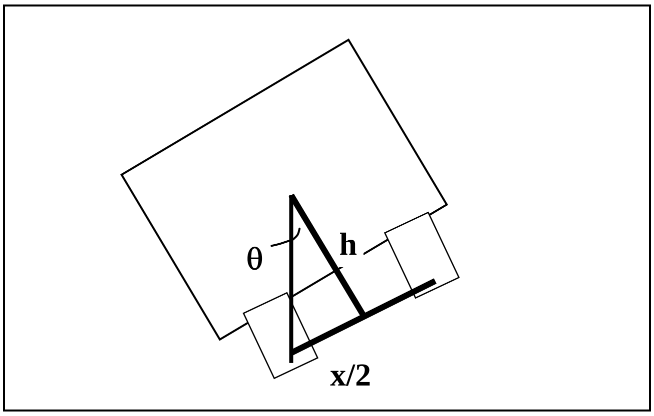
Even R is present, equilibrium cannot be achieved.
About A, both the moment produced by W and R are anticlockwise.
(when the upper wheel loses contact with the ground, R disappears)

(c) Marginal case



The CM (center of mass) of the car locates just above the lower wheel. The upper wheel does not press against the ground, so R = 0.
Then there is no turning moment about A. Equilibrium is marginally achieved

CM lies on the right of A ⟶ not overturn
CM lies on the left of A ⟶ overturn
CM just above A ⟶ marginal case



From the above figure, $\tan\theta = \dfrac{x}{2h}$

1995MC (15)

Green light is NOT reflected

2nd = (m+ 1/2)λ

2(1.25)d = (m+1/2)550 nm

m	d	
0	110 nm	
1	330 nm	
2	550 nm	←

1995MC(19)

The db will be increased by 3 when the intensity is doubled.

At a point of constructive interference, the intensity will be four times higher than that of a single wave.

The intensity is 4 times lower, so the db will be decreased by 6 db.

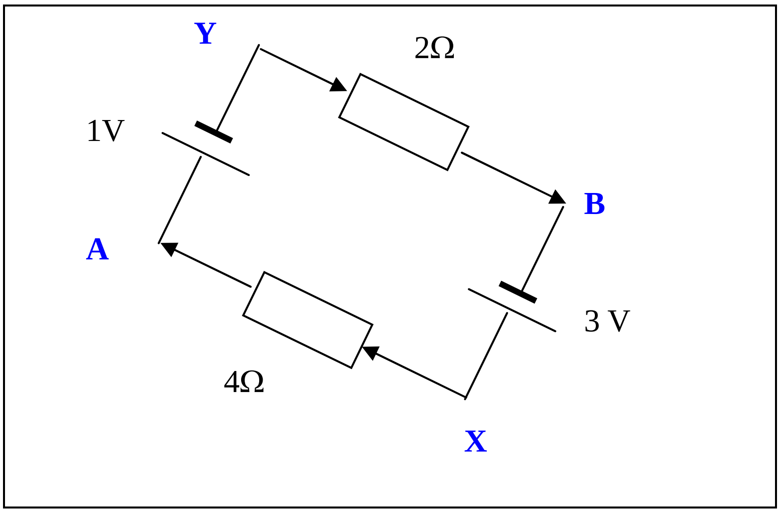
1995MC(21)

. r.m.s. speed = 341 ms^{-1} Temperature T = 298 K

By $\frac{3}{2}\mathrm{RT} = \frac{1}{2}\mathrm{M_m}\overline{\mathrm{c}}^{2}$, where M_m is the molar mass.

M_m is found to be 63.9 g

23.



Net emf of the circuit = 3 –1 = 2 V

Current = 2/6 = 1/3 A (dir: XAYBX)

We walk from X to Y via A

X to A: potential drop = 4(1/3) =4/3V

A to Y: potential drop = 1 V

Net p.d. = 4/3 + 1 = 2.33V

Alternatively, we walk from X to Y via B

X to B: potential drop = 3 V

B to Y: potential rise = 2(1/3)

Net p.d. 3 – 2/3 = 2.33 V

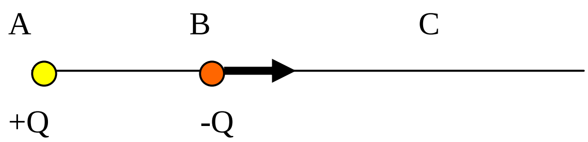
1995MC (25)

Initial p.d. across capacitor V_o = maximum current (i,e, the current at t = 0) x R

= 100 x 50 = 5000 A

Initial charge stored in cap = CV_0 = 5 x 10^{-3} C

1995MC(27).



(1) Correct. To move the negative charge from B to C, a positive work is done on the system, i.e. the system gains potential energy.

(2) Correct. Before the move, the two E-fields at C 

After the move, they become

(3) Incorrect. After the move, the potential at C will be more negative because the negative charge is brought nearer.

1995MC(31)

By symmetry, p.d. across L_1 = 6 V

$P = V^2/R$. R is unchanged, so $P \propto V^2$

When V = 12 V, P = 8W. When V = 6 V , P = 8/4 = 2 W

1995 MC (38)

(1) EM wave (visible or X-ray) is emitted during a transition from a higher energy level to a lower one.

(2) length = speed of light x time = $3 \times 10^8 \times 10^{-9}$ = 0.3 m

(3) $hf = E_f - E_i$

1995MC (39)

$$\varepsilon = \frac{N_2(AB)}{t}$$

(i) We are not interested in the direction of ε, so we drop the "-' sign.

(ii) The current decreases uniformly, so dI/dt => I/t

(iii) B is produced by the inside solenoid, $B = \mu_o n_1 I$

(iv) What is A ?

Inside A_2, only the part A_1 has an B-field passing through

AB should be divided into $A_1(\mu_o n_1 I) + (A_2 - A_1)0 = A_1 \mu_o n_1 I$

Inside a long solenoid $B = \mu_o n_1 I$;
outside a long solenoid, B is approximately zero

In view of all these considerations, $\varepsilon = N_2 (A_1 \mu_o n_1 I)/t$

1995MC (42)

. 1.5 cycles on screen. It corresponds to $1.5 \times \frac{1}{7.5} = 0.02s$

The screen has four divisions, so one division corresponds to 004/8 = 0.005 s

So the time base is 5 ms per division.
