Mechanics and Energy Test Memo

QUESTION 1:

1.1) A.
1.2) B.
1.3) B.
1.4) C.
1.5) A. (5x2)

QUESTION 2:

2.1) Length of AB: $\sin 30° = \frac{10}{AB}$

i.e. AB = 20m. (2)

2.2) $E_p = mgh$
= (300)(9,8)(10)
= 29 400 J. (4)

2.3) **According to the Law of Conservation of Mechanical Energy:**

$$\left(\text{mgh} + \frac{1}{2}\text{mv}^2\right)\text{A} = \left(\text{mgh} + \frac{1}{2}\text{mv}^2\right)\text{B}$$

(29 400 + 0) = (0 + ½(300)V^2)
196 = V^2
i.e. V = 14 $m.s^{-1}$.

But in $km.h^{-1}$ is V = 3.89 $km.h^{-1}$ (5)

2.4) Yes, the trolleys move in a closed system. (1)

QUESTION 3:

3.1) It is the energy that an object possesses because of the object's height above the Earth's surface. (2)

3.2.1) **According to the Law of Conservation of Mechanical Energy:**

$$\left(mgh + \frac{1}{2}mv^2\right)A = \left(mgh + \frac{1}{2}mv^2\right)B$$

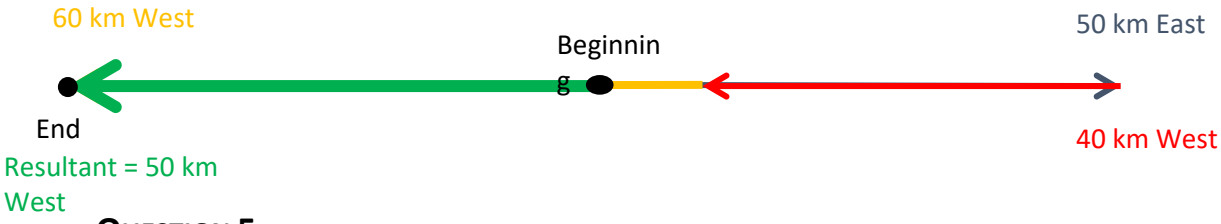
$6{,}45 = 1{,}23\ V^2$

$V = 2{,}29\ m.s^{-1}$

QUESTION 4:

4.1) It is a single vector that has the same effect as all the other vectors together. (2)

4.2) 1cm SV 10 N



(4)

Resultant = 50 km West

QUESTION 5:

5.1) The energy that the object possesses because of the object's movement. (2)

5.2)

If the mass = $m = \frac{2E_k}{V^2}$

According to the Law of Conservation of Mechanical Energy:

$$\left(mgh + \frac{1}{2}mv^2\right)A = \left(mgh + \frac{1}{2}mv^2\right)B$$

$$\left[\left(\frac{2E_k}{V^2}\right)(9{,}8)(4) + 0 = 0 + \frac{1}{2}\left(\frac{2E_k}{V^2}\right)V^2\right]$$

$78{,}4\ E_k = V^2E_k$

i.e. $V = 8{,}85\ m.s^{-1}$

(6)

5.3) Increase (1)

QUESTION 6:

6.1) When the ball is dropped, the potential energy will be at maximum, because the height is at maximum. The Kinetic energy will thus be zero when the object is dropped, but increases when the object is busy falling. Mechanical energy remains intact throughout the movement, because there are no external forces exercised onto the object. (4)

6.2.1) The height is on a maximum thus the potential energy will also be on maximum. (2)

6.2.2)

$E_p = mgh$

19.6 = (0,5)g(4)

i.e. g =9.8 $m.s^{-2}$