مدونة المناهج السعودية

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الموقع التعليمي لجميع المراحل الدراسية

في المملكة العربية السعودية

مراجعة نهائية لمادة الفيزياء

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فيزياء (١ - ٦)

أحر خبري

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الفصل الدراسي ( ) للعام الدراسي( )

فيزياء - أحمد خبري -

مراجعة شاملة لمادة الفيزياء الفصل الدراسي الأول

مراجعة شاملة

وحدات القياس :

الكتلة = كجم	مسافة = متر	الطول = متر
* mass → Kg	* distance → m	* length → m

الزمن = ثانية	الإزاحة = متر مع الإتجاه
* time → s	-* displacement → m (west-east .....)

سرعة متجهة = م/ث (تحديد الاتجاه)	سرعة قياسية = م/ث	تسارع = م/ث^2
velocity → m/s (west – up)	speed → m/s	* acceleration → m/s^2 مع الإتجاه

*force , weight القوة والوزن → نيوتن (N {est}) = $Kg\ m/s^2$ كجم . م / ث^2

*work , Energy الشغل والطاقة → جول $J = N . m$ $J = Kg\ m^2/s^2$

*Power القدرة → Watt واط $[W] = J/S$ $W=N.m/s$ مهم $W = Kgm^2/s^3$

ويمكن إشتقاقها

The fundamental (Base) quantity الكميات الأساسية cannot be defined

الطول ← متر	الكتلة ← كجم	الزمن ← ثانية
* length → m	* mass → Kg	* time → s

الحرارة Temperature = Kelvin = K كلفن / amount of substance كمية المادة = mole مول

Luminous intensity شدة الإضاءة = Candela Cd / electric current شدة التيار = A أمبير

Not base (not fundamental) (derived) الكميات المشتقة (اى شيء غير الثلاثة) canbe defined يمكن إشتقاقها

Ex : velocity , density , force acceleration , volume

سرعة كثافة قوة تسارع حجم

vector quantity (not scalar) الكميات المتجهة (magnitude and direction) تحدد بالمقدار والاتجاه

Ex: velocity - displacement - acceleration - force - weight

مثال: سرعة متجهة الإزاحة تسارع قوة الوزن

scalar quantity كميات قياسية Magnitude only

(vector اى شي يذكر غير) Ex: speed - year -distance-mass- power – work – energy.....

سرعة زمن مسافة كتلة قدرة شغل طاقة

(١)

التحويلات الهامة :

(P) Pico = 10^{-12} (بيكو)
(n) nano = 10^{-9} (نانو)
(μ) micro = 10^{-6} (ميكرو)
(m) milli = 10^{-3} (ميللي)
(T) Tera = 10^{12} (تيرا)
(G) Giga = 10^{9} (جيجا)
(M) Mega = 10^{6} (ميجا)
(K) Kilo = 10^{3} (كيلو)
(C) Centi = 10^{-2} (سنتي)

Min → S x 60 (دقيقة ← ثانية)
hr → S x 60 x 60 (ساعة ← ثانية)
hr → min x 60 (ساعة ← دقيقة)

EX : gram = 10^{-3} kg

Apico meter (pm) = 10^{-12} m

micro meter(μm) = 10^{-6} m

km ⇄ m (×10^{3} / ×10^{-3})

m ⇄ c.m (×10^{2} / ×10^{-2})

m ⇄ mm (×10^{3} / ×10^{-3})

معلومات هامة على المنهج

* where velocity constant ⟶ acceleration = zero — عندما تكون السرعة ثابتة فالتسارع = صفر

* where acceleration = zero ⟶ velocity constant — عندما يكون التسارع = صفر فالسرعة تكون ثابتة

* at the maxi mum height the velocity of a stone thrown vertically up = zero — عند أقصى ارتفاع تكون سرعة الحجر = صفر

* a freely falling body has constant a acceleration= 9.8 m/s^2 — التسارع الثابت عند السقوط الحر = ٩.٨ م/ث^2

* the vertical acceleration for a projectile at maxi mum height is −g — لتسارع الراسي فى المقذوفات عند أقصى ارتفاع = -g

* the velocity of freely falling(drop) bodily increase — السرعة لجسم يسقط سقوط حر تزداد

* the slope of position – time graph give (velocity) — ميل الموقع مع الزمن يعطى السرعة

* the slope of displacement – time graph give (velocity) — ميل الإزاحة مع الزمن يعطى السرعة

* the slope of velocity – time graph give (acceleration) — ميل السرعة مع الزمن يعطى التسارع

* the first derivative of position with aspect to time is (velocity) — المشتقة الأولى للموقع = السرعة

* The second derivative of position with aspect to time is acceleration — مشتقة الثانية للموقع مع الزمن يعطى التسارع

* The first derivative of velocity with aspect to time is acceleration — مشتقة الأولى للسرعة يعطى التسارع

* When a particle moves along the positiv direction of x- axis its displacement is(positive — إزاحة باتجاه موجب لمحور × تكون موجبة

إذا أعطى position r (t) = ~~~~ أو X(t) = ...

١) إذا طلب position نعوض مباشرة عن قيمة (t)

٢) إذا طلب velocity تشتق مرة ثم يعوض عن قيمة (t)

٣) إذا طلب acceleration تشتق مرتين ثم نعوض عن قيمة (t)

٤) إذا طلب average velocity نعوض مباشرة عن t_1 ثم عن t_2 ونطبق القانون $v = \frac{x_2 - x_1}{t_2 - t_1}$

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* إذا أعطى velocity V(t) = ...

١) إذا طلب velocity نعوض مباشرة عن t

٢) إذا طلب acceleration تشتق مرة واحدة ثم نعوض عن قيمة

CH 2 تعريفات

* **Displacement** الإزاحة Change in position [vector] التغير فى الموقع

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* **Velocity** السرعة Rate change of displacement with time معدل الإزاحة بالنسبة للزمن

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* **Speed** : (1) is the magnitude of velocity مقدار السرعة المتجهة
(2) scalar = it distance per time المسافة على الزمن

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* **Average velocity** السرعة المتوسطة المتجهة The rate at displacement in time
معدل الإزاحة بالنسبة للزمن

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* **Average speed** السعة المتوسطة القياسية The distance it travels divided by time it takes

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* **Acceleration** التسارع The rate of change of velocity and time
معدل التغير فى السرعة بالنسبة للزمن

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* **Instantaneous acceleration** التسارع الخطى Rate of change of velocity with time

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* **Distance** المسافة Total length of travel [absolute value of displacement] القيمة المطلقة للإزاحة

CH 3

Projectile Motion حركة المقذوفات **Two Diminution** (فى بعدين)

Horizontal افقى	Vertical عمودي
* Distance $X = V_0 . \cos\theta \; t$ المسافة	* Distance $y = V_0 . \sin\theta \; t - \frac{1}{2} gt^2$
* Velocity $V_x = V_0 . \cos\theta$ السرعة	* Velocity $V_y = V_0 . \sin\theta - gt$ إذا أعطى زمن
	$V_y = V_0 \sin\theta$
* acceleration $(a_x) = 0$ التسارع الافقى = صفر:	* $a_y = -9.8$ [- g]
Velocity (V_x) ⟶ Constant (ثابتة)	V_y ⟶ Change متغيرة

* **Range** : the **horizontal distance** travelled by a projectile المدى هى المسافة الأفقية فى المقذوفات

The unit of Range ⟹ [m]

* Horizontal Range المدى الافقى $R = \frac{V_0^2 \sin(2\theta)}{g}$ $* R_{max} = \frac{V_0^2}{g}$

Angle maximum Range $\theta = 45^0$ ← * زاوية أقصى مدى

Angle maximum (height) $\theta = 90^0$ ← * زاوية أقصى ارتفاع

* At the **maximum height** the velocity is **zero** عند أقصى ارتفاع السرعة = صفر

* the **shape(Path)** of projectile motion is (**parabola**) شكل حركة المقذوفات قطع مكافئ

* projectile motion : the motion of a projectile under **gravity** حركة المقذوفات تتحرك تحت تأثير الجاذبية

الارتفاع height $H = \frac{V_0^2 \sin^2(\theta)}{2g}$ أقصى ارتفاع $H_{max} = \frac{V_0^2}{2g}$

Ch4

* **Types of force** أنواع القوى

(A) Fundamental Force * قوى أساسية

1- gradational [gravity] قوى الجاذبية 2- Weight الوزن 3- Nuclear نووية

4- Electromagnetic كهرومغناطيسية

(B) Contact force [touching] * قوى التلامس

1- Normal force قوى العمودية 2- Tension قوة الشد 3- Friction قوى الاحتكاك

4- Spring force قوى النابض

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* **Newton first law** قانون نيوتن الأول **Law inertia** $\Rightarrow F_{net} = Zero$

No force on Body **No acceleration** لا يوجد قوة ولا يوجد تسارع

يسمى القانون الأول: ١- قانون الاتزان **Equilibrium balance law** ٢- قانون القصور الذاتى **Law inertia**

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* **Newton second law** قانون نيوتن الثاني [**law Acceleration**] $a = \frac{\Sigma F}{m}$

The Net Force act on Body is equal to the product.....**mass** ,and **acceleration**.

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* **Newton Third law** قانون نيوتن الثالث [**tow bodies** ..... **Opposite** .....]

$F_{1 \to 2} = -F_{2 \to 1}$ قانون الفعل ورد الفعل [**action - reaction**] law

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* If the body is **equilibrium [Balance]** $\Sigma F =$ **zero** اذا كان الجسم متزن فان مجموع القوى = صفر

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* when the **mass** of body **decrease** its **acceleration** after applying the force is **increase**

إذا قلت الكتلة زاد التسارع

أنواع الاحتكاك :

* **Static friction (Fs)** قوة الاحتكاك القوى It is the friction at **rest** قوى الاحتكاك ساكن

* **Kinetic friction (Fk)** قوة الاحتكاك الحركى It is the friction at **motion** يوجد حركة

μ_s , μ_k معامل الاحتكاك 0.2 - 0.1 - ٠٠ (اكبر من الصفر واقل من الواحد) ليس لها وحدة قياس

* Friction coefficient without unit [**No unit**] $\mu s > \mu k$

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* **Inertia** القصور الذاتى : **Resist** any change in the motion هو الذى يقاوم اى تغير فى الحركة

* The **mass** refers to the same physical **inertia** القصور الذاتى يشير الى نفس مصطلح الكتلة فيزيائيا

*** Normal force** القوى العمودية

It is the force exerted by surface on an object and always **perpendicular** the surface **contact (upward)**

القوى متعامدة على السطح (تلامس) (يكون لها اتجاه الي اعلي)

Tension force [string - **wire** - **rope**] قوة الشد هى القوة تنشأ فى السلك او الحبل

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* If body moves with **constant velocity** then sun force equal **zero** إذا كانت السرعة ثابتة القوة = صفر

الفرق بين الكتلة والوزن

*** Mass** : How much matter in the object الكتلة كمية المادة الموجودة بالجسم **Scalar quantity**

* **Don`t change** from place to another الكتلة كمية قياسية لا تتغير بتغير المكان **[fixed] – Not force**

ليست قوة الوحدة kg gravity on the moon = on-sixth of Earth جاذبية القمر = $\frac{1}{6}$ جاذبية الأرض

*** Weight** :how much **gravity** will pull the object الوزن **Vector quantity [force]**

* **Change** from place to another الوزن كمية متجهة تتغير بتغير المكان *الوزن تمثل القوة

*الوحدة **Newton** نيوتن مع الاتجاه direction is **down ward** اتجاهه دائما لأسفل

CH 5 - CH 6

***Types of Energy** أنواع الطاقة

Work شغل **Kinetic** حركية **Potential** وضع

*** potential energy** طاقة الوضع (1) **store energy** in object الطاقة المختزنة فى الجسم

(2) defined by the Energy of **position** الطاقة الموضع $U = m \cdot g \cdot h$

*** Kinetic energy** : one – **half** the product of a **moving object** ` s **mass** and the square of its **speed**

طاقة الحركة : نصف حاصل ضرب كتلة الجسم المتحرك فى مربع سرعته

* It is the energy ossaiated with the **motion** [**moving**] of in object $K = \frac{1}{2} m v^2$

الطاقة الناتجة عن حركه الجسم

*** Mechanical Energy** : It is **sum** of **kinetic energy** and **potential energy**

$E = K + u = 0.5\ mv^2 + m g h$ الطاقة الميكانيكية تساوى مجموع طاقتي الحركة والوضع

*** work Energy theorem** نظرية الشغل والطاقة

Chang in kinetic energy = work done الشغل المبذول = التغير فى الطاقة الحركية

Work and **gravitational potatinial** $\Delta U = - W$

* The **change of potatinial** is **Negative the work** done

التغير فى طاقة الوضع يساوى سالب الشغل المبذول

ملحوظة : اذا كانت محصلة الشغل تساوى صفر فان طاقة الحركة تبقى ثابتة كما هى

* If **the net work** done on an object is **zero** then object`s kinetic energy **remain the same**

إذا كانت الزاوية بين القوة والسرعة = ٩٠ فان الشغل = صفر

*when the angle Between **Force** and **Velocity** is **90**(perpendicular) The power = **zero**
إذا كانت الزاوية بين القوة والإزاحة = ٩٠ فان الشغل = صفر

* when the angle Between **Force** and **displacement** is **90** The work = **zero**
إذا كانت الزاوية = صفر(موازي) فان الشغل او القدرة = قيمة عظمى

* when the angle = **zero**(parallel) ⟶ work , power = **maximum value**
إذا كانت الزاوية = ١٨٠ فان الشغل او القدرة = قيمة صغرى

*when the angle = **180** ⟶ work , power = **minimum**

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* **conservation force** القوى المحفوظة **work total = zero** الشغل الكلى = صفر

It is **any force** for which the **work done** over any closed path is **zero**

EX : **spring force** قوى النابض **graviton force** قوى الجاذبية - **Weight** الوزن

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* **non conservation force** قوى غير محفوظة It is any **force** for which the **work done** over any closed path is **non zero** الشغل الكلى لا يساوى صفر

Work total ≠ zero EX : **kinetic friction force** قوى الاحتكاك الحركي **Tension force** قوة الشد

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* **conservation of mechanical energy** قانون حفظ الطاقة الميكانيكية

the **kinetic energy** and **potential energy** remains **constant** طاقة الحركة وطاقة الوضع تبقى ثابتة

Mechanics energy in **initial** equal **final energy** او الطاقة الميكانيكية الابتدائية =الطاقة الميكانيكية النهائية

(k + u) before = (k + u) after

(1) The **Total mechanical energy** is [**constant** in case of conservation energy]

E_T = **constant** الطاقة الكلية ثابتة

(2) Change in total energy **zero** ΔE = **zero** التغير في الطاقة الكلية صفر

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* **Work** : 1) The **energy** transferred to or from an object due to the **action of a force** الشغل

2) **product** scalar between **force** and **displacement** انتقال الطاقة من جسم لآخر من خلال القوة

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* **Power** : rate between **work** and **time [the work per time]** القدرة هى النسبة بين الشغل والزمن

* **Wattx second** is unit of **Energy** الواط فى الثانية وحدة الطاقة

* **Isolated system** نظام معزول system **(No) force make energy** change

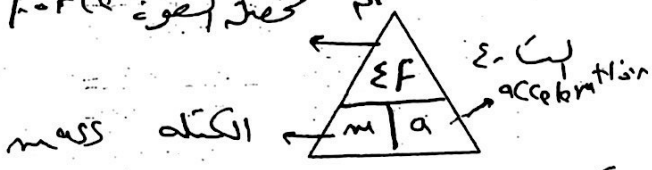
لا توجد عليه قوة خارجية تغير الطاقة

ملحوظة : اذا كانت الجسم ساكن (السرعة= صفر) فان طاقة الحركة = صفر **K = 0 فان V = 0 rest**

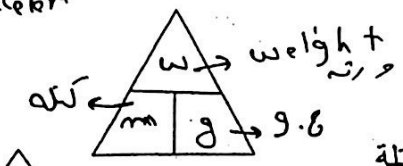
If the particle at the ground level→ **u = 0** * اذا كان الجسم موضوع على الارض فان طاقة الوضع = صفر

CH6 , CH5 , CH4 قوانين

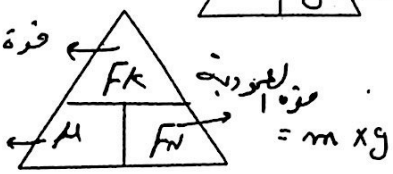
القوة أو التسارع أو الكتلة



لإيجاد الوزن Weight أو الكتلة



قانون قوة الاحتكاك Kinetic friction



لإيجاد الطاقة الحركية **Kinetic Energy**

لإيجاد طاقة الوضع **Potential Energy**

لإيجاد الطاقة الكلية الميكانيكية **Mechanics Energy**

$K = \frac{1}{2} m v^2$

$u = m \cdot g \cdot h$

الكتلة 9.8 m/s الارتفاع height

$E_T = K + u$

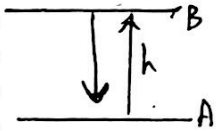
لإيجاد الشغل **Work**

1) $W = F \cdot d$

2) $W = F \cdot d \cos \Theta$ اذا كان هناك زاوية

3) $W = \frac{1}{2} m (V_F^2 - V_I^2)$ اذا أعطى سرعتان

V_F سرعة نهائية V_I سرعة ابتدائية



4) $W_{AB} = - u = - m \times g \times h$ ، $W_{BA} = mgh$

لإيجاد القدرة **Power**

1) $P = \frac{W}{t}$ ، $P = \frac{mgd}{t}$ 2) $P = F \cdot v$ 3) $P = F \cdot v \cos \Theta$

لإيجاد معدل القدرة **Average power**

$P = \frac{MV^2}{2t}$ قانون مختصر $P = \frac{\frac{1}{2} m(V_F^2 - V_I^2)}{t}$

القوة $F = - \frac{du}{dr}$ مشتقه طاقة الوضع

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* **Hok`s law** قانون هوك $F_s = - K x$ ثابت هوك k= (N/m)

شغل النابض **Work by spring** $= \frac{1}{2} k x^2$ ⟶ Energy of spring

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* **scalar product** الضرب القياسى $A \cdot B = A B \cos \theta$

i.i. = 1 $X \cdot X = y \cdot y = Z \cdot Z = 1$ / $X \cdot y = X \cdot Z = y \cdot Z = 0$

angle ⇒ $\Theta = \cos^{-1} \frac{A \cdot B}{|A||B|}$ لايجاد الزاوية

$X = i$
$y = j$
$Z = k$

أهم القوانين CH1 , CH2

لإيجاد مقدار المتجهة

* Magnitude = $\sqrt{Ax^2+Ay^2+Az^2}$

عندما يطلب الزاوية

* Angle (direction) $\theta = \tan^{-1}\left(\frac{y}{x}\right)$

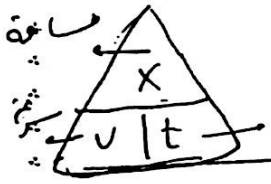
عندما يذكر فى السؤال x و x او y و y نأخذ (cos θ ضرب الرقم)

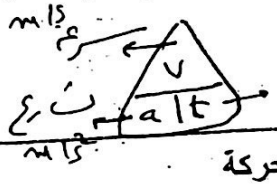
وعندما يذكر فى السؤال x و y نأخذ (sin θ ضرب الرقم)

أ/ أحمد خيرى على
٠٥٤٣٨٢٨١٠٧

II (-, +)	I (+, +)
(-, -) III	(+, -) IV

أجمع x معا واجمع y معا ثم حدد الإشارة





معادلات الحركة

تستخدم اذا لم يوجد مسافة فى المعطيات او المطلوب

تستخدم فى حالة لم يوجد زمن

تستخدم اذا لم يوجد سرعة نهائية (اذا وجد مسافة وزمن)

* $v = v_o + at$
* $v^2 = v^2_o + 2ax$
* $x = v_o t + \frac{1}{2} at^2$

* v_o = initial velocity سرعة ابتدائية
* V = final velocity سرعة نهائية [m/s]
* x = المسافة ، t = time الزمن
a التسارع acceleration ملحوظة : m/s^2
*the object rest الجسم من السكون ← $v_o = 0$ السرعة الابتدائية = صفر
* the object stop توقف الجسم ← v = zero السرعة النهائية = صفر

ملحوظة هامة : a= - و

معادلات الحركة الرأسية

تتبدل g بدلا من a و y بدلا من x

$v = v_o + gt$

$Y = v_o t + \frac{1}{2} gt^2$

$V^2 = v_o^2 + 2gy$

أ/ أحمد خيرى على
٠٥٤٣٨٢٨١٠٧

فل down أو سقوط حر free full

g= 9.8

v_o = zero

Dov

حالة السقوط الحر الى اسفل تسارع الجاذبية = + 9.8، م/ث٢
سرعة الابتدائية = صفر

maximum height
عند أقصى ارتفاع

thrown up
عند قذف الجسم إلى أعلى فان
$g = -9.8\ m/s^2$

السرعة النهائية v = zero

عند قذف الجسم الي اعلي فان g= -9.8 والسرعة النهائية =صفر

أسئلة من اختبارات سابقه (ch5, ch6)

* All of the following is **energy type except**
[kinetic - work - potential - **force**]

* What is the **gravitational potential energy** of **10 kg** body **10 m** above the floor ?
[950 J - 970 J - **980 J** - 990 J]
$U = m \cdot g \cdot h = 10 \times 9.8 \times 10 = 980\ J$

* **The gravitational potential energy** is **300 J** if the mass is **10 kg** so the **height** of the body is [20 m - 30 m - 40 m - **none**]
$U = mgh \Rightarrow h = \frac{U}{mg} = \frac{300}{10 \times 9.8} = 3.06\ m$

* Find **the kinetic energy** of **400 kg** car when its **speed** is **2 m/s**
[500 J - 600 J - 700 J - **800 J**]
$K = \frac{1}{2} m v^2 = \frac{1}{2} \times 400 \times (2)^2 = 800\ J$

* Which of the following is a correct unit of **energy** ?
[$kg\ m/s^2$ - $kg\ m^2/s$ - $kg\ m^2/s^2$ - $kg^2 m/s^2$ - **$kg\ m^2/s^2$**]

* Which of the following is a correct unit of **power**
[N - J - kg - **$kg\ m^2/s^3$** - $kg^2\ m/s$]

* **The mechanical energy** of the body is the **sum of** :
A) kinetic energy and work
b) kinetic energy and force
C) **kinetic energy and potential energy**
D) none

* Which of the following is a correct **unit work** ? [$kg\ m/s^2$ - N - **J** - W]

* A **100 kg** car accelerates from **0** to **10 m/s** in **2s** What is the **average power** delivered by the engine [1500 w - **2500 w** - 3500 w - 4500 w]

الحل $V_i = 0$ $m = 100$ $V_f = 10$ $t = 2$

$$P = \frac{\frac{1}{2} m[V_F^2 - V_i^2]}{t} = \frac{\frac{1}{2} \times 100[10^2 - 0^2]}{2} = 2500\ W$$

$P = \frac{mv^2}{2t} = \frac{100(10)^2}{2 \times 2} = 2500\ w$

* **The power** is defined as
[**The work per time** - the work per distance - the work per mass - none]

* The **force 400 N** act on a body for a distance **2m** then the **work done is**
[**800 Joule** - 400 Joule - 800 N - None]
$W = F \cdot d = 400 \times 2 = 800\ J$

* What **power** is needed to lift a **49 kg** person a vertical distance of **5.0 m** in **20.0 s** ?
[12.5 w - 60 w - 210 w - 25 w - **120 w**]
$P = \frac{mgd}{t} = \frac{49 \times 9.8 \times 5}{20} = 120\ w$

القوة المحفوظة — الشغل يعتمد على المسار

A conservative force is any force for which the **work done over any closed path is zero**

[true - false]

---

* A particle is moving along the x – axis subject to the potential energy $U = (x^2 + x + 4)$ J, determine the net force on the particle at **x = 5m** [-3N - 04N - -5N - -11N]

القوة $F = -\frac{dU}{dx} = -(2x+1) = -(2\times5+1) = -11$ N

---

* A constant force $\mathbf{F} = (2x + 2y)$ N acts on a particle causing a displacement of that particle by $\mathbf{r} = (3x + y)$ m, What is the **work done** by the force ?

[4 J - 2 J - 3 J - 8 J]

$W = F.r = (2x+2y)\cdot(3x+y) = 6 + 2 = 8$ J

---

* Which of the following is a **correct unit of potential energy** ?

طاقة الوضع

[$kg.m^2/s^2$ - $kg.m/s^2$ - $kg.m/s$ - $kg^2.m^2/s^2$]

---

* A 8 N force pulled a box on the ground with 60^0 angle from **x = 0m to x = 6 m**, then the **done work by this force equals :** [48 J - 24 J - 32 J - 14 J]

القوة θ

$W = F.d\cos\theta = 8(6-0)\cos60 = 24$ J

---

* Two vectors $A = 2x + 4y$, $B = 3x + 2y$, find **A . B** ? [14 - 24 - 33 - 30]

الحل $A.B = 6 + 8 = 14$

---

* What is the **mechanical energy** of (2kg) body , **5m** above the floor **at rest** :

[10 J - 100 J - 9.8 J - 98 J]

$E_T = K + U = \frac{1}{2}mv^2 + mgh = \frac{1}{2}\times2(0)^2 + (2\times9.8\times5) = 98$ J

الطاقة الميكانيكية — النظام المعزول

* **In isolated system** the total of **mechanical energy remains constant** [true - **false**]

وحدة قياس طاقة الحركة

* Which of the following is a correct **unit of a kinetic energy** :

[J - N - N/m - J.S]

---

* A stone of (**10 kg**) dropped down from (**10 m**) **height find the work** applied from gravitational force ? [9.8 J - 98 J - 980 J - 9800 J]

$W = m\times g\times h = 10\times9.8\times10 = 980$ J

---

* If **energy transferred** to an object then **work positive** : [**true** - false]

الطاقة تفعل الشغل — الشغل موجب

* A **watt x second** is a unit of [force - power - displacement- speed - **energy**]

* If the **net work** done on an object is **zero** then the object's **kinetic energy**
[decreases - **remains the same** - increases - is zero]

* The **energy in the spring** is (k = 0.5 and displacement 5 cm) : [1.5 joul - 0.9 joul - **none**]

$E = \frac{1}{2} k x^2 = \frac{1}{2}(0.5)(0.05)^2 = 6.25 \times 10^{-4} J$ $\quad x = \frac{5}{100} = 0.05$

* Which of the following is a **scalar quantity** [power - work - energy- **All of the above**]

* Which of the following quantity is **a vector quantity** ? [mass.work - **velocity** - length]

* When the angle between **force** and **velocity** is 90^0 the **power** have
[**zero** - maximum value - minimum value - infinity]

* When the angle between **force** and **displacement** is 0^0 the **work** have
[zero - **maximum value** - minimum]

* When the angle between **force** and **velocity** is 0^0 the **power** have
[zero - **maximum value** - minimum value - infinity]

* The **maximum work** of the body is happen when
1- **the force is parallel to the velocity** 2- The force perpendicular to the velocity

* The unit of the **power** in SI system is [N - Joule - **watt** - kg^2 m/s]

* Which of the following are **conservation force**
[weight - spring - gravitational - **all of the above**]

* Which of the following is **non conservation force**
[tension - friction - **a and b**]

* The gravitational **potential energy** is : [**mgh** - m - gh - none]

* The **law of conservation of energy** state that :
A) the total energy of the body change with time
b.) **the total energy of body is constant** c) the total energy is work d) none

* Which of the following could be a **power**[5 W east - **5 W** - 5 m/s - non]

* **300 watt** is [**300 kg m^2 / sec^3** - 3000 kg m^2 / sec^2 - 300 kg m /sec^2 - none]

* The force on the body is **14 Newton** and velocity is **3 m/sec** so the **power** on the body is
[42 Joule - **42 Watt** - 4200 Watt - none]

$P = F V = 14 \times 3 = 42$ W

* The amount of **work** required to stop a moving object is **equal** to the :
[velocity of the object - **kinetic energy of the object** - mass of the object]

* **A 5.0 kg** cart is moving horizontally at **6.0 m/s** In order to change its speed to **10.0 m/s** **the net work** done on the cart must be : [40 Joule - 90 Joule - **160 Joule** - 400 Joule]

$W = \Delta K = \frac{1}{2} m (V^2 - V_0^2) = \frac{1}{2} \times 5 [(10)^2 - (6)^2] = 160 J$

* A particle moves **5 m** in the positive x direction while being acted upon by a constant force **4 N** The **work done** on the particle by this force is :
[20 J - 10 J - **20 J** - 30 J - impossible]

$W = F \cdot d = 4 \times 5 = 20 J$

* The force **(4i – 8j)** act on a body for a distance **– 6j** then the **work done** is :
[**48 joule** - 480 joule - 800 erg - none]

$W = F \cdot d = (-8) \times (-6) = 48 J$

* How **much work** is done when a **75 kg** person climbs a flight of stairs **10 m** high at constant speed [**7350 J** - 105 J - 750 J - 75 J - 7500 J]

$W = m \cdot g \cdot h = 75 \times 9.8 \times 10 = 7350 J$

* particle of mass m to a force acting X – direction $F_x = 25$ N find the **work** by the particle moves from **X = 0 to X = 6 m**

الحل : $W = F \cdot d = 25 (6 - 0) = 150$ **J**

* If $V = -X + 2y$ $F = 2X + 5y$ then **power** is : [8 J - **8 W** - 5 W]

الحل $P = F \cdot V = -2 + 10 = 8$ W

* The **total mechanical energy** of a system
A) is equally divided between kinetic energy and potential energy
B) is either all kinetic energy or all potential energy at any one instant
C) can never be negative
D) **is constant only if conservative forces act**

* **a force** on a particle is **conservative** if :
A) its work equals the change in the kinetic energy
B) it obeys Newton`s second law
c) **its work depends is zero**

* In the vector product the value of **i.i** is [0 - **1** - 2 - 3 - none]

* In the vector product the value of **i.j** is [**0** - 1 - 2 - 3 - none]

* In the vector product the value of **i.k** is [**0** - 1 - 2 - 3 - none]

* If the angle between two vectors a and b is 0^0 then the **scalar product** of them is
[0 - 1 - $\vec{a} \cdot \vec{b}$ - 11.6 - none]

* The **fiction force** is a **conservative force** [true - **false**]

---

* As defined in physics, **work** is :
[**a scalar quantity** - always a positive quantity - a vector quantity - always zero]

---

* An object `s **gravitational potential energy** is **directly** related to all of the following
EXCEPT [Its height - Its mass - **Its speed** - Acceleration due to gravity]

---

* If A = 3x + 4y and B = 5x + 6y find **A . B** ? [18 - 45 - **39** - 10]

---

* If Khaled exerts a force of **600 N** to walk **50 m** up a flight of stairs in **10 s** , How much **power** does the use ? [30000 W - **3000 W** - 300 W - 3 W]

$P = \frac{Fd}{t} = \frac{600 \times 50}{10} = 3000\ W$

---

* The **energy of motion** is called[**kinetic energy** - potential energy- thermal energy- wor]

---

* An object`s **kinetically energy** is **directly** related to all of the following
[Its height - Acceleration due to gravity - distance - **Its mass**]

---

* **1 joule** = 1 [$N.m^2$ - $kg.mls^2$ - **N.m** - $N^2.m^2$]

---

* The **law of conservation of energy** state that
1- The total energy of the body change with time
2- **The total energy of body is constant** 3- The total energy is the work

---

* The **work done** on a closed path by **conservative force** is
[**zero** - maximum - constant - infinity]

---

* **No energy** transfer into or the system this is
[work - power - **isolated system** - mechanical energy]

---

* If kinetic energy = 80 j and potential = 20 j then mechanics energy is ?
[60 j - **100 j**] الحل $E = K + u = 80 + 20 = 100\ j$

---

* If the **potential energy** is given by $u = -2r^2 - 3r + 5$ find the **force** at distance r = 2m
$u = -2r^2 - 3r + 5$ الحل :

$F = \frac{-du}{dr} = -(-4r - 3) = -4r + 3$ at r = 2m $\longrightarrow$ F = 8 + 3 = **11 N**

---

* What **power** where work **80 J** and time = **2 sec**

$P = \frac{W}{t} = \frac{80}{2} = 40\ W$ الحل :

الزاوية ١٨٠

* When the angle between force and velocity is 180^0 the **power** have
[**minimum value** - maximum vale - zero]

---

* The **mechanical energy is vector** quantity [true - **false**]

---

* The **unit of kinetic energy is watt** [true - **false**]

---

* **Gravitational force** is an example of a **conservative force** [**true** - false

---

* Which of the following is a correct **unit a work**
[kg . m - **N . m** - N / J - J . N]

---

* If A = 3x + 4y , B = 8x + 6y What is the **angle between A and B** ?
[39.4 - 46.9 - **16.2** - 53.6]

$A \cdot B = 24 + 24 = 48$ $|A| = \sqrt{3^2+4^2} = 5$ $|B| = \sqrt{8^2+6^2} = 10$

$\theta = \cos^{-1} \frac{A \cdot B}{|A||B|} = \cos^{-1} \left(\frac{48}{5 \times 10}\right) = 16.2^\circ$

---

* The SI unit of **force** [kg m/s - **kg m/s^2** - kg m/s^3]

---

* **mass 2 kg** and **acceleration** (8x + 6y) m/s^2 What **magnitude force** body is
[10 N - **20 N** - 5 N - 40 N]

$\Sigma a = \sqrt{(8)^2 + (6)^2} = 10 m/s^2$ $F = ma = 2 \times 10 = 20$ N : الحل

---

* **Newton second law** of motion state that the net force act on a body is equal to the **product** of the body 's **mass** and its **acceleration** [**true** - false]

---

* The **weight gravitational force** exerted by the **earth** on the object [**true** - false]

---

* SI unit of **Normal force** is [kg . m/s - **kg m/s^2** - kg m/s^3 - m/s^2]

---

* Which of the following is an **example on a force**
[work - energy - velocity - **electromagnetic**]

---

* A particle is pulled to **the left** with a force of **30 N** and to **the left** with a force of **15 N** the **net force** on the particle is
45 N to the left - 15 N to the right
35 N to the left - 51 N to the right]

$30 + 15 = 45$ N left

ch1,2,

* What is the **magnitude** of the vector $6x + 8y$? [4 - 5 - 8 - **10**]

$\sqrt{6^2+8^2} = 10$

---

* **The y** – component of a vector having length of **20 m** at an angle of 30^0 with **x** axis is equal [6 - 12 - **10** - 22]

$y = 20 \sin 30 = 10$

---

* **The x** – component of a vector having length of **10 m** at an angle of 60^0 with **x** axis is equal [**5** - 1 - 8 - 3]

$x = 10 \cos 60 = 5$

---

* What is the **direction** of a vector $3x + 6y$? [26.9^0 - **63.4^0** - 98.9^0 - 56.8^0]

$\theta = \tan^{-1}\left(\frac{y}{x}\right) = \tan^{-1}\left(\frac{6}{3}\right) = 63.4$

---

* **1 kg** is equal : [10^4 g - **10^3 g** - 10^{-3} g - 10^{-4} g]

---

* **A gram** is : [10^{-6} kg - 1 kg - **10^{-3} kg** - 10^3 kg]

---

* The **scalar** quantities have **only a magnitude** [**true** - false]

---

* If an object moves whit **constant velocity** then it is an **acceleration is zero** [**true** false]

---

* A particle moves from rest to **10 m/s** find its acceleration (in m/s^2) after **2s** ?

[**5** - 10 - 3 - 7]

$a = \frac{V}{t} = \frac{10}{2} = 5 \ m/s$

---

* Which of the following quantity is a **basic quantity** ?

[velocity - force - **length** - acceleration]

---

* Which of the following quantity is a **derived quantity** ?

[length - **force** - mass - time]

---

* The vector **position** of a particle varies in time according to the expression $\mathbf{r(t) = 4x + 6t^2 y}$ in the **velocity** of the particle after **1 s** equal to ? [4 - 5 - 8 - **12**]

$= 12t\,y \Rightarrow 12(1)\,y = 12y \Rightarrow \sqrt{12^2} = 12$

---

* The velocity of a particle is given with respect to time as $v = t^3$ What is the particle's **acceleration at t = 1 s** ? [**+3** - -6 - +7 - -2]

$a = 3t^2 = 3(1) = 3$

---

* A particle moves according to the equation : $x = t^3 + 1$, Where x is in meters and t is in Seconds the **velocity** at t = 2 s is :

[8 m/s - 10m/s - -1.8 m/s - **12 m/s**]

$V = 3t^2 = 3(2)^2 = 12$

* **Velocity** of particle moving in space is given by $V(t) = (4t\,x + t^3\,y - 8z)$ m/s
What is the **magnitude of the acceleration** of the particle at t = 1s
[**5 m/s²** - 29 m/s² - 15 m/s² - 18 m/s²]

$a = 4x + 3t^2 y \Rightarrow 4x + 3(1)^2 y = 4x + 3y \Rightarrow \sqrt{4^2 + 3^2} = 5$

---

* **80 m / hr** is equal to
[800 cm / hr - 80 cm / hr - **8000 cm / hr** - 80000 cm / hr]

$\frac{80\,m}{hr} = \frac{80 \times 10^2}{1}\,\frac{cm}{hr} = 8000$

---

* The slope of **velocity – time** graph gives **length** [true - **fulse**]

---

* A stone thrown from the top of a building is given an **initial velocity of 40 m/s** straight upward Determine **the time** at which the stone reaches its **maximum height**
[**4.08 s** - 2.9 s - 9.06 s - 5.15 s]

$t = \frac{V}{g} = \frac{40}{9.8} = 4.08\,s$

---

* Two vectors are given by $a = 2x + 2y + 3z$ $\quad b = -2x + 2y - 3z$
The magnitude vector (b +a) equal: [1 - 2 - 3 - **4**]

$a + b = 4y \Rightarrow \sqrt{4^2} = 4$

Two vectors are given by : $a = x + y$ $\quad b = 2x + 2y + 4z$
The **magnitude vector (b – 2a)** equal : [2 - **4** - 6 - 8]

$b - 2a = (2x + 2y + 4z) - (2x + 2y) = 4z \Rightarrow \sqrt{4^2} = 4$

---

* A car start its motion from **rest** with constant **acceleration of 4 m/s²** its **velocity** after **4 sec** is [4 m/s - 8 m/s - **16 m/s** - 22 m/s]

$V = at = 4 \times 4 = 16\ m/s$

---

* A particle starts its motion from **rest** with constant acceleration of **2 m/s²** find the **displacement** of the particle after **3 sec** [**9 m** - 20 m - 4 m - 1 m]

$x = v_0 t + \frac{1}{2} a t^2 = 0 + \frac{1}{2} \times 2 \times (3)^2 = 9\ m$

---

* A particle moves from **rest** with acceleration **4m/s²** find its **velocity** (in m/s) after **2 m** ?
[0 - **4** - 9 - 2]

$V^2 = v_0^2 + 2ax \Rightarrow V^2 = 0 + 2(4)(2) = 16 \Rightarrow V = \sqrt{16} = 4$

---

* Which of the following is a **fundamental unit** ? [W - **m** - N - m/s]

---

* **At the maximum height** the **velocity** of a stone thrown vertically
[**zero** - increases - decreases - infinity]

---

* A speed of **7 mm / μs** is equal to [**7000 m / s** - 70 m / s - 7 m / s - 0.07 m / s]

$\frac{7\,mm}{\mu s} = \frac{7 \times 10^{-3}}{10^{-6}}\,\frac{m}{s} = 7000\ m/s$

* The **property of an object at rest** is known as
[internees - **inertia** - resistance - sluggishness]

---

* The projectile vertical acceleration (**a y**) is
[change - **constant** - zero - infinity]

---

* The SI unit of **horizontal range** [N - **m** - m/s - N.m]

---

* **position** $r(t) = 2t\,x + 3t\,y + t^4 z$ What **magnitude acceleration** at **t = 2sec**

$V = 2x + 3y + 4t^3 z$: الحل

$a = 0 + 0 + 12t^2 z$ $= 12(2)^2 z = 48z$

$\sqrt{(48)^2}$ $= 48\ m/s^2$

---

* Compare three SI units kilogram Millimeter and second Which is the **largest**
[kilogram - millimeter - second - **the unit are not comparable**]

---

* Which of the following quantity is a **vector** quantity ?
[mass - temperature - **displacement** - length]

---

* Which of the following is a **Scalar quantity** ?
[Acceleration - Displacement - Velocity - **Speed**]

---

* A particle start its motion from rest with constant acceleration of **2.5 m/s²** its **velocity** after **2 sec** is [9 m/s - **5 m/s** - 2.5 m/s - 11 m/s]

$V = at = 2.5 \times 2 = 5$ m/s

---

* $A = 4x + 2y + 3z$, **2A** equal :
[$10x + 6y + 4z$ - $10x + 8y$ - **$8x + 4y + 6z$** - $10x + 2y + 4z$]

$2A = 2(4x + 2y + 3z) = 8x + 4y + 6z$

---

* If a **net force** acts on a particle is **zero** , then the magnitude of **acceleration** of a particle will be **zero**
[**true** - false]

---

* A force of **20 N** moved a particle **3 m** in its direction what is the **work done** by the force
[**60 J** - 90 J - 20 J - 87 J]

$W = F \cdot d = 20 \times 3 = 60$ J

---

* Which of the following is a **fundamental unit** ? [W - **m** - N - m/s]

* **144 m/min²** is equal to : [1 cm/s² - 2 cm/s² - 3 cm/s² - **4 cm/s²**]

الحل ⇒ $\frac{144\ m}{min^2} = \frac{144 \times 10^2}{(60)^2}\ \frac{cm}{s^2} = 4\ cm/s^2$

---

* If an object moves with **constant velocity** then it's a **acceleration** is
[positive - Negative - Infinity - **zero**]

---

* Which of the following could be a **distance** ? [4 m west - **4m** 4m/s west - 4m up]

---

* Which of the following could be **a speed** ? [100 m u - **100 m/s** - 100 m/s up - 100 m]

---

* Which of the following could be **displacement**
[20 m - 20 m/s - **20 m west** - 20 m/s west]

---

* Which of the following could be **velocity**
[20 m - 20 m/s - 20 m west - **20 m/s west**]

---

* Which of the following quantities could specify an **acceleration vector**
[5 m / s² - **5 m / s² downward** - 5 m / s North - 5 m² / s West]

---

* **velocity** is defined a
a- position / time
~~b-~~ **Rate of change of displacement with time**
c- Rate of change of velocity with time
d- change in position

---

* **speed** is the **magnitude** of
[position - **velocity** - displacement - Acceleration - none of these]

---

* **A vector** has
a- magnitude only
~~b-~~ **both magnitude and direction**
c- direction only
d- None

---

* The number of **significant figures** in **0.00150** is [**3** - 2 - 5]

---

* The number of **significant figures** in 15.00 is [3 - **4** - 5]

---

* If a vector **A = 4x + 3y** What is the magnitude of the vector **2A** ? [4 - 12 - **10** - 6]

$2A = 8x + 6y \Rightarrow \sqrt{8^2 + 6^2} = 10$

أسئلة CH 3 من اختبارات سابقه

* The projectile **vertical velocity** (V_y) is [**change** - zero - infinity - constant]

* After a projectile is fired horizontally near the earth's surface, **the horizontal** component its **velocity** (v_x)
[increases - decreases - first decreases , then increases - **remains constant**]

V_0 θ

* A particle is thrown with an initial **velocity of 50 m / s** with an angle **30^0** above the Horizontal What is **vertical velocity (v_y)** [10 m / s - 2.5 m / s - 43 m / s - **25 m / s**]

$V_y = V_0 \sin\Theta = 50 \sin 30 = 25$ m/s الحل احسب السرعة الراسية

V_0 θ

* A ball is thrown with an **initial velocity of 80 m / s** with an angle **60^0** above the horizontal What is **horizontal velocity (V_x)** احسب السرعة الأفقية

[2.5 m/s - 30 m/s - 35 m/s - **40 m/s**]

$V_x = V_0 \cos\Theta = 80 \cos 60 = 40$ m/s الحل

---

* With of the following in the **trajectory of the projectile motion** الحل حركة المقذوفات

- [straight line صواريخ **parabola** - circle]

---

* The **projectile motion** is a حركة المقذوفات لها بعدان

a-one dimensional b-**two dimensional** c-three dimensional

---

* After a projectile is fired horizontally near the earth`s surface, the horizontal component The projectile **horizontal acceleration (a x)** is : السارع الافقي

[change - constant - **zero** - infinity]

---

* Which of the following is correct relation of **rang**

[$R = \frac{V_0^2}{g}$ - $R = \frac{V_0}{g}$ - **$R = \frac{V_0^2 \sin(2\Theta)}{g}$** - **$R = \frac{V_0^2 \sin(2\Theta)}{3g}$**]

---

* The **vertical acceleration** for projectile at **maximum height** is : Which of the following is relation of **maximum Rang** اعظم مدى

[$\frac{V_0^2}{g}$ - $\frac{V}{g}$ - $\frac{V^2_0}{2g}$ - $\frac{V_0^2 \sin 2\Theta}{g}$]

---

* The **vertical acceleration** for a projectile at **maximum height** is : عند اعظم ارتفاع

[zero - g - **-g** - infinity]

---

* What will be initial **angle** (Θ) to get the **maximum** horizontal (**R ange**) in projectile motion عند اعظم مدى

[$\Theta = 60^0$ - **$\Theta = 45^0$** - $\Theta = 30^0$ - $\Theta = 90^0$]

---

* What will be initial angle (Θ) to get the **maximum height** (H max) in projectile motion

[$\Theta = 60^0$ - $\Theta = 45^0$ - $\Theta = 30^0$ - **$\Theta = 90^0$**]

---

* A gun with initial velocity of **20 m/s** shoot a target by angle of **15^0** then its **range(R) is**

[**20 m** - 30 m - 25 - none of them]

$R = \frac{V_0^2 \sin(2\theta)}{g} = \frac{(20)^2 \sin(2 \times 15)}{9.8} = 20.4$ m

(15)

* A body is thrown with an initial velocity ($V_0 = 10$ **m/s**) What is **maximum Range** ?

$$R_{max} = \frac{V_0^2}{g} = \frac{10^2}{9.8} = 10.2$$ الحل

---

* **At the maximum height** the **velocity** of a stone thrown vertically

[**zero** - increases - decreases - infinity]

A ball is thrown with an **initial velocity of 100 m/s** with an angle 30^0 above The horizontal what is the **vertical velocity** Vy at **t= 2sec**

[10.4 m/s - 20.4 m/s - **30.4 m/s** - 40.4 m/s]

$V_y = V_0 \sin\theta - gt = 100 \sin 30 - (9.8 \times 2) = 30.4$ **m/s** الحل

---

* A boll was thrown with (**20 m/s**) initial velocity at (30^0) above X – axis the maximum **height** is : [2.1 m - 3.1 m - 4.1 m - 5.1 m]

الحل $\Rightarrow H = \frac{V_0^2 \sin^2\theta}{2g} = \frac{(20)^2 \sin(30)^2}{2 \times 9.8} = 5.1$ m

---

Ch4 ← أستعلم

* A dog has mass **15 kg** the **weight** of dog is

[127 N - 137 N - **147 N** - 157 N]

الحل $\Rightarrow w = mg = 15 \times 9.8 = 147$ N

---

* The coefficient of the static friction μ_s has a unit

[Newton - joule - kg - **none**]

---

* The correct relation between the coefficient of static and kinetic friction

[$\mu s < \mu k$ - **$\mu s > \mu k$** - none of above]

---

* Which of the following could be coefficient of **static friction** μs

[0.1 N - 0.1 W - 0.1 cm - **0.1**]

---

* Which of the following could be **a force**

[100 m - 100 W - 100 m/s west - **100 N east**]

---

* If an object is in **equilibrium** state so the **sum of the forces** which acting on it is

[9.8 - **zero** - -9.8 - all the above are correct

---

* If the body moves with **constant velocity** so the **forces** on it is

a- the weight of the body b- **zero** c- the reaction force d- the frictional force

كل ما يأتي قوة ما عدا

* All of the following are **forces except**
[friction - tension - **work** - nuclear]

---

* The **unit of force** in SI is :
[**Newton** - meter - gram - second - none]

---

* **A Newton** is
[1 kg/s - 1kg x m/s - **1kg x m/s²** - 1kg x m²/s - 1kg x m²/s²]

---

* **The kinetic friction** for a body of mass **1 kg** ($\mu_k = 0.8$) is
[0.7 Newton - **7,8 Newton** - 0.7 joule - none]

$F_k = \mu_k \cdot m \cdot g = 0.8 \times 1 \times 9.8 = 7.8\ N$

---

* The force acting on a body 0f **5 kg** mass is **(3 x + 4 y) N** the magnitude of the **acceleration** of the body is : [**(1 m/s²** - 2.0 m/s² - 2.5 m/s² - 3.0 m/s²]

$a = \frac{\Sigma F}{m} = \frac{\sqrt{3^2 + 4^2}}{5} = \frac{5}{5} = 1$

---

* An object is pulled to the **right** with a force of **10 N** and to the **left** with force of **15 N** the **net foree on the object is**
A) 25 N to the left b) 25 N to the right c) **5 N to the left** d) 5 N to the right

$\Sigma F = 15 - 10 = 5\ N$ Left

تكون الاتجاه من القوة الاكبر

---

* Three force acting on a body $\vec{F}_1 = -6x + 2y + 5z$ $\vec{F}_2 = 2x + y - 5z$
$\vec{F}_3 = 4x + 3y$ The **magnitude of net force** ($|\vec{F}_{net}|$) is
[3 N - 4 N - 5 N - **6 N**]

$\Sigma F = 6y \Rightarrow \sqrt{6^2} = 6\ N$

---

* Three force acting on a body **of 25 kg** : $\vec{F}_1 = 3x + 2y + 8z$ $\vec{F}_2 = 2x + y + 2z$
$\vec{F}_3 = -5x + 4y - 10z$ The **magnitude of acceleration** ($|\vec{a}|$) is
[0.49 m/s² - 0.91 m/s² - **0.28 m/s²** - 0.07 m/s²]

اصبح مقدار الـ

$a = \frac{\Sigma F}{m} = \frac{7y}{25} = \frac{\sqrt{7^2}}{25} = \frac{7}{25} = 0.28$

---

* when the **mass** of body **decrease** its **acceleration** after applying the force is
[decrease - **increase** - Non] إذا قلت الكتلة زاد التسارع

---

* Two force $F_1 = -3x - 5y + 20z$ $F_2 = 3x + 5y + 10z$ act on a 30 kg block
The **magnitude of the acceleration**
Of the block is [1m/s² - 2m/s² - 3m/s² - 4m/s²]

الحل : $\Sigma F = F_1 + F_2 = 0 + 0 + 30\ \Sigma$ $\sqrt{30^2} = 30$

$a = \frac{\Sigma F}{m} = \frac{30}{30} = \mathbf{1\ m/s^2}$

قانون نيوتن الأول

* **Newton first law** of motion state that : لا توجد قوة ولا يوجد تسارع
a- body move with high speed
b- **no force on body no acceleration**
c- body at rest remain at movement all time
d- all of the above

---

* Newton`s **third law** of motion state that : قانون نيوتن الثالث
a- the net force act on a body is equal to the product of the body's mass and its acceleration
b- **Two bodies** interact the force on the bodies are equal in magnitude and **opposite** in direction
c- If no net force acts on body the body cannot accelerate
d- All of the above

---

* Newton`s **third law** of motion state that : قانون نيوتن الثالث
[$\vec{F}_{1\to2} = -\vec{F}_{2\to1}$ - $\vec{F}_{1\to2} = \vec{F}_{2\to1}$ - $\vec{F}_{1\to2} \neq -\vec{F}_{1\to2}$ - None of the above]

---

* The net force act on a body is equal to the product of the body`s **mass** and its **acceleration** This is [ Newton `s first law - **Newton`s second law**] كتلة - تسارع - قانون نيوتن الثاني

---

* **The inertia** of a body tends to cause the body to : يقاوم التغير من الحركة
a- speed up
b- slow down
c- **resist any change in its motion**
d- fall toward the earth
e- decelerate due to friction

---

* The **term "mass"** refers to the **same physical** concept as :
[weight - **inertia** - force - acceleration - volume]

---

* An object moving at **constant velocity** in an inertial frame must :
a- have a net force on it
b- eventually stop due to gravity
c- not have any force of gravity acting on it
d- **have zero net force acting on it**

---

* The **inertial reference** frame :
a- **body applying Newton`s law of motion**
b- body do not applying Newton`s law

---

* **Mass differs from weight** in that الكتلة تختلف عن الوزن
a- all objects have weight but some lack mass
b- **weight is a force and mass is not** الوزن قوة و الكتلة ليست قوة
c- the mass of an object is always more than its weight
d- mass can only be expressed in the metric system
e- there is no difference

---

* **Acceleration** is a always in the **direction** التسارع يكون بنفس اتجاه محصلة القوة
[of the displacement - of the initial velocity - of the final velocity - **Of the net force** - opposite to the friction force]

---

* **The normal force** is the force due to القوى العمودية
a- the friction force its direction west
b- **the surface force its direction up ward** إتجاهها لأعلى
c- the weight of the body it direction upward
d- none of them

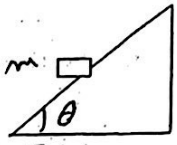
---

* The **force** is [scalar - **vector** - magnitude - none] المتجه

* A block **m = 30 kg** Which slides down a frictionless plane having an in clination of 15^0 the **acceleration** of the block is [5.7 - **2.5** - 6.2 - 3.6]

$a = g \sin\Theta = 9.8 \sin 15 = 2.5\ m/s^2$

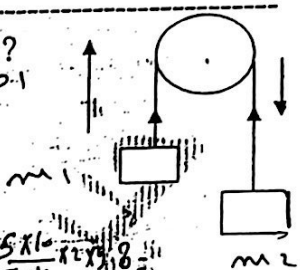
الحل :



---

* At wood machine * $m_2 = 10$ kg $m_1 = 5$ kg find **acceleration** ?

$a = \frac{m_2 - m_1}{m_2 + m_1} x g = \frac{10-5}{10+5} x\ 9.8 = 3.2\ m/s^2$: الحل



What **tension**

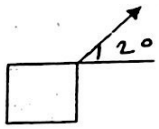
$T = m_1 (g + a) = 5 (9.8 + 3.2) = 65$ N : الحل

---

* A box of mass **50 kg** is placed on an incline as shown in the figure a force F is exerted on of the box it moves **frictionless** [$a = 4\ m/s^2$] What **magnitude force** [F]

[212.8 N - 312.8 N -

412.8 N - 512.8 N]



$f \cos\theta = ma \Rightarrow f = \frac{ma}{\cos\theta} = \frac{50 \times 4}{\cos 20} = 212.8\ N$

---

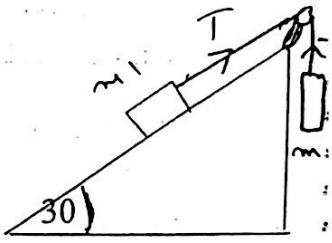
* A mass $m_1 = 10$kg on a frictionless inclined plane is attached to a light string The plane is at an **angle** $\theta = 30^0$ above the horizontal m_1 moves up with **1m/s²**

What is the **tension** on the light string ?

$m_1 = 10$kg $a = 1\ m/s^2$ $g = 9.8$

الحل :

$T = m_1 a + m_1 g \sin\theta = (10 \times 1) + (10 \times 9.8 \times \sin 30) = 59$ N



---

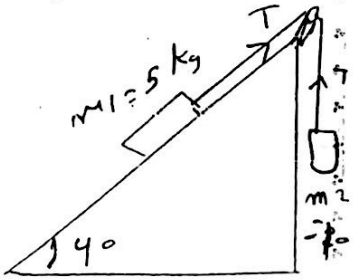
* Two boxes passes over a pulley , and tension force in the wire **T = 53.7 N** What is the **Acceleration** for any box ? [$1.4\ m/s^2$ - $2.4\ m/s^2$ - $3.4\ m/s^2$ - **$4.4\ m/s^2$**]

$T = 53.7$ N $m_1 = 5$kg $m_2 = 10$ $g = 9.8\ m/s^2$ $\theta = 40$

الحل :

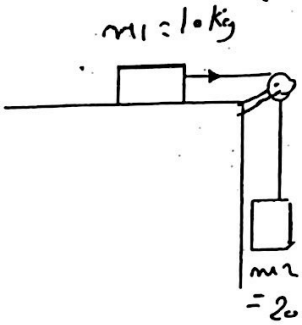
$a = \frac{T - m_1 g \sin\Theta}{m_1} = \frac{53.7 - (5 x\ 9.8 x\ \sin 40)}{5} = 4.44\ m/s^2$

حل اخر $a = \frac{m2g - m1g \sin\theta}{m1 + m2} = \frac{10x9.8 - (5x9.8 \sin 40)}{5+10} = 4.4\ m/s^2$



* $m_1 = 10$ kg $m_2 = 20$ kg find **tension force** and **acceleration**

a= ?? T = ??

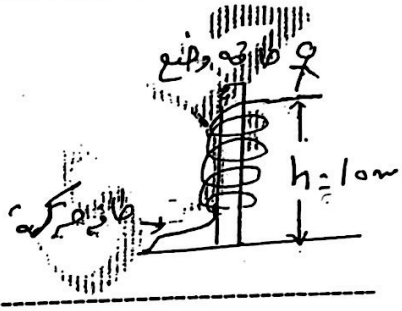


$a = \left(\frac{m_2 g}{m_1 + m_2}\right) = \left(\frac{20 \times 9.8}{20+10}\right) = 6.5\ m/s^2$: الحل

$T = g\left(\frac{m_1 m_2}{m_1 + m_2}\right) = 9.8\left(\frac{10 \times 20}{10+20}\right) = 65\ N$

---

* In fig what velocity



$(K+U)_{أعلى} = (K+U)_{أسفل}$

$0 + U = K + 0 \Rightarrow mgh = \frac{1}{2} m v^2$

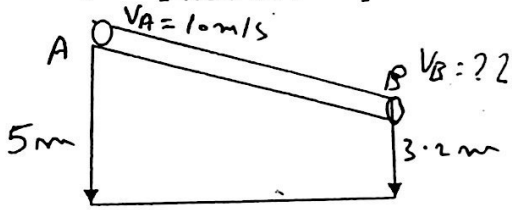
$9.8 \times 10 = \frac{1}{2} v^2 \Rightarrow v^2 = 196 \Rightarrow v = \sqrt{196} = 14\ m/s$

$v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 10} = 14\ m/s$ ⇒ حل مختصر

---

* A ball m is released from point (A) with a speed V_A = ~~10 m/s~~ and it moves on the friction less track , using energy conservation what is the speed V_B at point (B) ?

[**11.63 m/s** - 12.63 m/s - 13.63 m/s - 14.63 m/s]



الحل :

$V^2 = V_0^2 + 2g(h_2 - h_1)$

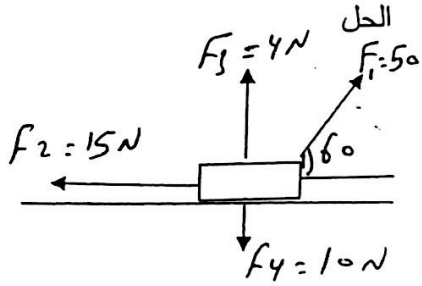
$V^2 = (10)^2 + 2 \times 9.8 (5 - 3.2)$

$V^2 = 135,28$

$V = \sqrt{135.28} = 11.63$ m/s

---

* A box moves horizontally frictionless in right direction with velocity **v = 2 m/s** as shown in the figure What is total power [5 watt - 10 watt - **20 watt** - 25 watt]



$\Sigma F = 50 \cos 60 - 15 = 10$ نأخذ المركبة الأفقية فقط

$P = \Sigma F \cdot V = 10 \times 2 = 20$ watt

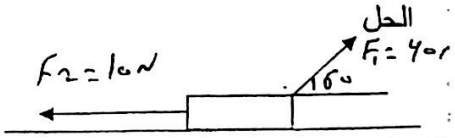
---

* A box moves horizontally frictionless in right direction with displacement d = 5 m as shown in the figure What is **the total work done**

Where ($F_1 = 40$ N ، $F_2 = 10$N ، $\theta = 60^0$)

$\Sigma F = F_1 \cos\theta - F_2 = 40 \cos 60 - 10 = 10$

$W = \Sigma F \cdot d = 10 \times 5 = \mathbf{50\ J}$



(2) The position $x = 1 + 2t$ what average velocity $t_1 = 1s$ to $t = 4s$

at $t = 1 \Rightarrow x_1 = 1 + 2(1) = 3$ ، at $t = 4 \Rightarrow x_2 = 1 + 2(4) = 9$

$v_{avg} = \frac{x_2 - x_1}{\quad} = \frac{9-3}{\quad} = 2\ m/s$

* What the **angle** Ø between two vector $a = 2x - 3y$, $b = 4x + 2y$

الحل :

$a \cdot b = 8 - 6 = 2$

$|a| = \sqrt{2^2 + 3^2} = 3.6$ $\quad |b| = \sqrt{4^2 + 2^2} = 4.5$

$\theta = \cos^{-1}\left(\frac{a.b}{|a||b|}\right) = \cos^{-1}\left(\frac{2}{3.6 \times 4.5}\right) = 82.9^0$

---

* Apotnail energy give $u = x^2 y^3 + xy^2$ find force at (1,1) m

الحل :

$F = -\frac{du}{dr} \Longrightarrow \frac{du}{dx} = (2xy^3 + y^2)$

$\frac{du}{dy} = 3y^2 x^2 + 2yx \Longrightarrow F = -\frac{du}{dr} = -\left[(2xy^3 + y^2)\hat{x} + (3y^2x^2 + 2yx)\hat{y}\right]$

$F = -[(2+1)x + (3+2)y]$

$F = -3x - 5y \qquad F = \sqrt{3^2 + 5^2} = 5.8\ N$

---

* $A = 2x + 4y$, $B = 3x + 5y$, $C = 2x + 6y$ Find $(A + B) \cdot C$

الحل :

$A + B = 5x + 9y$

$(A + B) \cdot C = 10 + 54 = 64$

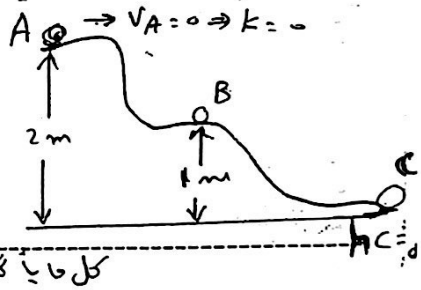
---

* $A = 5$, $B = 10$, angle A and B $\theta = 60$ Find $A \cdot B$

$A \cdot B = 5 \times 10 \cos 60 = 25$

---

* A ball of mass 2 kg released from rest from point A then slides down a friction less surface calculate 1) The speed of the ball at Point B 2) the **speed** of ball at point C



الحل

① $V_B^2 = V_A^2 + 2g(h_A - h_B) = 0 + 2 \times 9.8(2-1)$

$V_B^2 = 19.6 \Rightarrow V = \sqrt{19.6} = 4.4\ m/s$

② $V_C^2 = V_A^2 + 2g(h_A - h_C) = 0 + 2 \times 9.8(2-0) = 39.2$

$V_C^2 = 39.2 \Rightarrow V_C = \sqrt{39.2} = 6.2\ m/s$

---

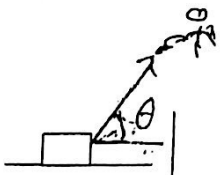
* All of the following are work unit except

[J - N . m - $kg\ m^2/s^3$ - $kg\ m^2/s^2$]

كل ما يأتي وحدات الشغل ما عدا

- الرسومات الهامة :

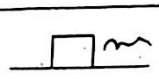
١ لإيجاد القوة العمودية Normal Force (Fv)



Normal force :

$F_N = mg - F \sin\theta$

$F_N = mg \cos\theta$



$F_N = mg$

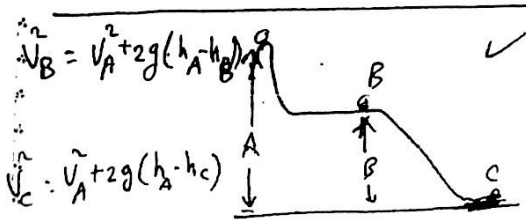
Net force [F Net] = m g sin □

إذا طلب التسارع بدون احتكاك

$a = g \sin\theta$

إذا طلب التسارع فى وجود احتكاك

$a = g \sin\theta - \mu \cos\theta$

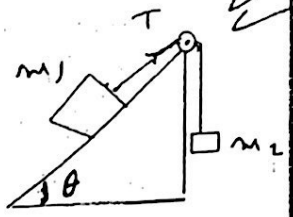


$T = m_1 g \sin\theta + m_1 a$

١- إذا طلب قوة الشد Tension

٢- إذا طلب التسارع acceleration

$a = \frac{m_2 g - m_1 g \sin\theta}{m_1 + m_2}$ أو $a = \frac{T - m_1 g \sin\theta}{m_1}$



١- لإيجاد التسارع acceleration بدون احتكاك أملس (smoth) frictionless

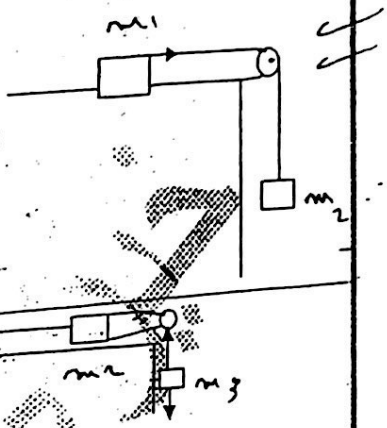
$a = \frac{m_2 g}{m_1 + m_2}$

٢- لإيجاد قوة الشد Tension

$T = \frac{m_1 m_2}{m_1 + m_2} g$

٣- التسارع فى وجود احتكاك (rough خشن)

$a = \frac{m_2 - \mu m_1}{m_2 + m_1} xg$

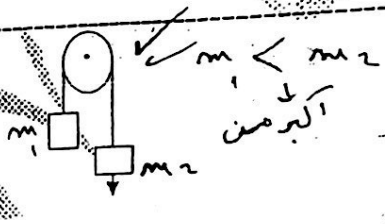


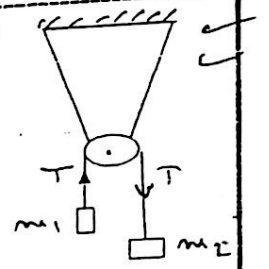
$a = \frac{m_3 g}{m_1 + m_2 + m_3}$

$a = \frac{m_2 - m_1}{m_1 + m_2} g$ acceleration ١- التسارع

Tension ⇒ $T = m_1 (g+a)$ ٢- الشد

$T = \left(\frac{m_1 \times m_2}{m_1 + m_2}\right) 2g$





$T = m a$ → T

$T \cos\theta = m a$

$T \sin\theta = m g$

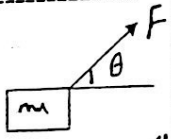
$F \cos\theta = m a$

(1) $a = \frac{F \cos\theta}{m}$

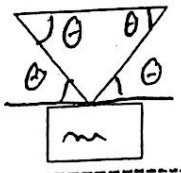
(2) $F \sin\theta = m g$

(3) $F_{Net} = m g \cos\theta$

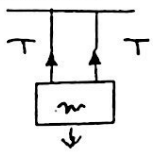
$F = \frac{ma}{\cos\theta}$

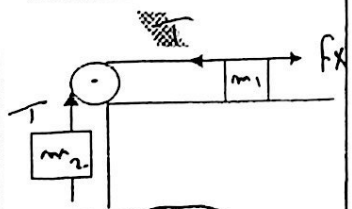


$T = \frac{mg}{2\sin\theta}$



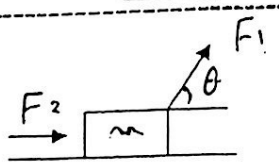
$T = \frac{mg}{2}$



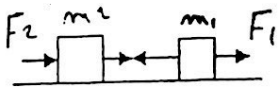


$F_x = m_1 a + T$

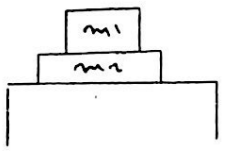
$T = m_2 a + m_2 g$ أو



$a = \frac{F1 \cos\theta + F2}{m}$



$a = \frac{F1 + F2}{m1 + m1}$



FN =-(F1+F2)

FN =-g(m1+m2)

Fnet = zero

(ex) A 3 Kg and velocity $V = 4x + 5y$ Find Kinetic Energy: أوجد الطاقة الحركية

(الحل) ⇒ $V = \sqrt{4^2 + 5^2} = 6.4 m/s$ ⇒ $K = \frac{1}{2} m v^2 = \frac{1}{2}(3)(6.4)^2 = 67.5 J$

* A person pushes the left most box trough
With a **force 320 N** the box accelerate to the right at **8 m/s²** (1) What the mass **M** of the middle box ? [7 kg - 9 kg - 13 kg - **21 kg**]

الحل :

$F = m\,a \Rightarrow 320 = (12 + 7 + M)\,8$

$\frac{320}{8} = 19 + M \qquad 40 = 19 + M \qquad M = 40 - 19 = 21\ kg$

(2) What the **force by the middle** on the **left most box** [153 N - **224 N** - 253 N - 289 N] F12 احسب القوة

الحل :

$320 - F21 = m_1 a \Rightarrow 320 - F21 = 12\,(8)$

$320 - F21 = 96 \Rightarrow F21 = 320 - 96 = \mathbf{224\ N}$

---

* If **no external force** are acting on a moving object will
[continue moving the **same velocity**] إذا لم يوجد قوة فان الجسم يتحرك بنفس السرعة

---

* The two measurements necessary for calculating **average speed** are
[distance and acceleration - **distance and time** - none]

---

* A horse run distance of 10 km in time 30 minutes it's average speed
[15 km / h - **20 km / h** - 30 km / hr]

الحل : 30 min = ½ h

$V_{avg} = \frac{\Delta X}{\Delta T} = \frac{10}{0.5} = \mathbf{20\ km/h}$

---

* **Twelve second** after starting form **rest** object **falling** will **have speed** of
[0.5 m/s - 100 m/s - **more than 100 m/s**]

الحل :

$V = gt = 9{,}8 \times 12 = 117.6\ m/s > 100$

---

* Starting from **rest** the **distance** a **freely – falling** in 1 sec [10 m - **5 m** - 2 m]

الحل :

$\Delta y = \frac{1}{2}\,a t^2 = \frac{1}{2}\,(9.8)\,(1)^2 = 4.9\ m \approx 5$

---

* A (**10 N**) falling object enconcounters **4 N of air resistance** the **net force**
[4 N - 10 N - **6 N**]

الحل : $F_{Net} = 10 - 4 = 6\ N$

---

* Whenever the **net force** on an object **zero** its **acceleration**
[**is zero** - may be less than zero - may be more than zero]

---

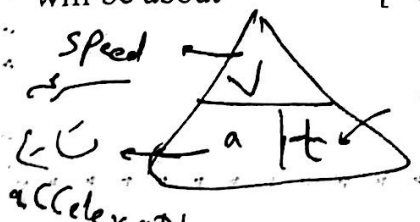
* **The kinetic energy** of a **8.00 kg** particle is **100 J** find its **velocity** ?
10.5 m/s - 8.00 m/s - **5.00 m/s** - 10.0 m/s]

الحل : $K = \frac{1}{2}\,mV^2 \Rightarrow V = \sqrt{\frac{2K}{m}} = \sqrt{\frac{2 \times 100}{8}} = 5\ m/s$

---

* If a car accelerates form rest at 2 meters per second per second its speed 3 seconds later will be about [2 m/s - **6 m/s** - 4 m/s - 3 m/s]

الحل : $V = a\,t = 2 \times 3 = 6\ m/s$



* A tow truck exerts a **force of 3000 N** on a car accclcrating it at **2 meters per second per second** What is the **mass** of the car ?

[**1500 kg** - 500 kg - 1000 kg - 3000 kg - none of these]

الحل : $F = m\,a \Rightarrow m = \frac{3000}{2} = 1500\ kg$

Bonus : A variable force is applied on an object the force versus position (x) is shown in the figure (here right) (At **x = 4.00 m** **F = 5.00 N** and at **x = 7.00 m F = -5.00 N**)

a) What is the work done by the force between **x = 0.00 m** and **x =2.00 m** ?

[**10 J** - 8.00 J - 7.50 J - 8.50 J]

b) What is the work done by the force between **x = 4.00 m** and **x = 6.00 m** ?

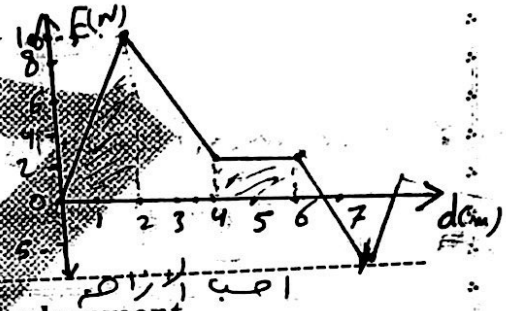
1.00 J - 2.00 J - 2.50 J - **3.00 J**]

a) W = **area under graph** : الحل

مساحة المثلث = ½ القاعدة × الارتفاع = ½ x 2 x 10 = **10 J**

b) **area under rgrap** = 4 x 2 = **8 J**

ملحوظة : مساحة المستطيل = الطول × العرض



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* Sarah travels **57 m est**. and then travels **34 m south** What **displacement**

[**66 m** - 70 m - 19 m]

الحل : $d = \sqrt{57^2 + 34^2} = 66\ m$

---

* An object is propelled as right – line by a force if the net **force were doubled** the object`s **acceleration** would be [four times - **twice as much** - the same]

إذا كان محصلة القوة تتضاعف فأن التسارع يزداد مرتين

$F = m \cdot a$

---

* Imagine a car travels **10 m north** and **10 m west** and **10 m south** final goes **10 m east** What **displace ment** [4 m **0 m** - 20 m]

---

* The **force friction 10 N** the **applied force** to maintain **contestant velocity** is

[less than 10 N - mor than 10 N - **10 N**]

اذا كانت قوة الاحتكاك = ١٠ فان قوة الجذب للجسم اذا كانت السرعة ثابتة = ١٠ نيوتن

ملحوظة : اذا كانت هناك لا يوجد قوة فأن الجسم يتحرك بنفس السرعة وكذلك التسارع = صفر

* If **no external force** tem 1- moving **same velocity** 2- **acceleration = zero**

---

* **Acceleration** equals the **change** in .....per unit of time

[displacement - distance - **velocity** - speed]

---

* **velocity** is the **change** in .....per unit of time

[**displacement** - distance - velocity - speed]

ch 7

momentum → vector كمية متجهة

الزخم

$P = m \cdot v$ ← وحدته Kg m/s

الكتلة — السرعة — Velocity

(*) What is the momentum of (5 kg) body moves of (30 m/s) velocity [50 kg m/s, 100 kg m/s, 150 kg m/s]

الحل $P = m \cdot v = 5 \times 30 = 150$ kg m/s

(*) momentum is vector quantity الزخم كمية متجهة

[true - false]

(*) in the elastic collision the total kinetic energy remains constant [true - false]

(*) momentum is defined as the product of an objects mass and the velocity

[true , false] الزخم هو حاصل ضرب الكتلة × السرعة