

أوراق عمل وتدريبات على الرسوم البيانية للظاهرة الكهروضوئية



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف الثاني عشر المتقدم ← فيزياء ← الفصل الأول ← ملفات متنوعة ← الملف

تاريخ إضافة الملف على موقع المناهج: 2026-10-14 20:29:54

ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل
منهج انجليزي | ملخصات وتقارير | مذكرات وبنوك | الامتحان النهائي | للمدرس

المزيد من مادة
فيزياء:

إعداد: عبدالرحمن عصام عيد

التواصل الاجتماعي بحسب الصف الثاني عشر المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الثاني عشر المتقدم والمادة فيزياء في الفصل الأول

شرح وأسئلة المجالات الكهربائية وقانون جاوس

1

الموقع والزمن فيزياء تاسع انسباير inspire G9 Physics when and Where

2

امتحان تكويني مع الإجابات نص سردي بعنوان (أحلام صغيرة)

3

شرح الجهاز الغطائي: الأنسجة وطبقات الجلد

4

Chapter 1: Electric Fields الكهرباء المجالات: الاولى الوحدة

5

تحميل تطبيق المناهج للهواتف الذكية

تطبيق المناهج على Play Google (أندرويد)

تطبيق المناهج على Store App (آبل)

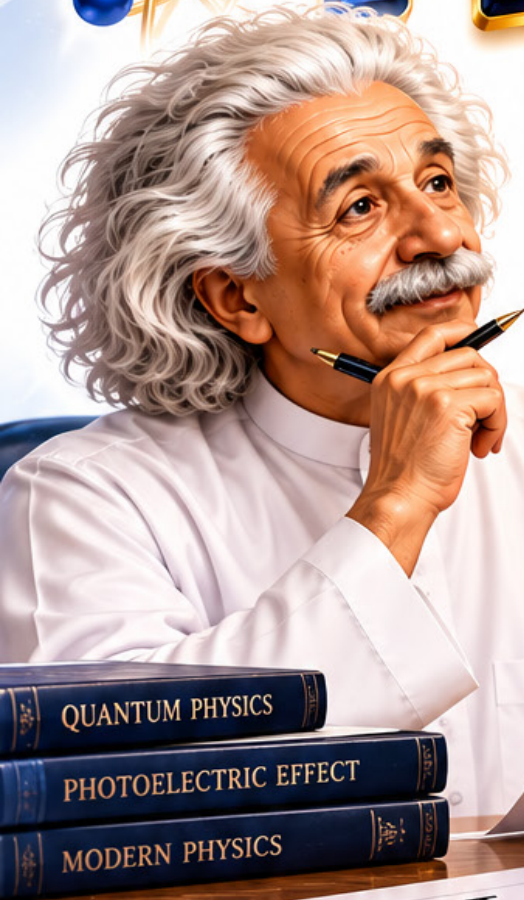


Photoelectric Effect

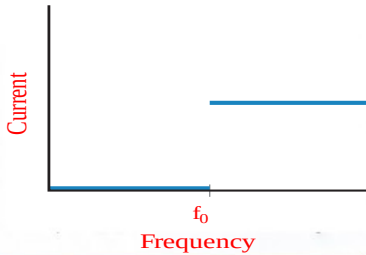
اينشتاين العرب مصدر الاول للعلامة الكاملة

$$K_{\max} = hf - hf_0$$

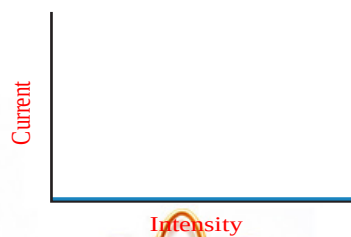
$$E = hf$$



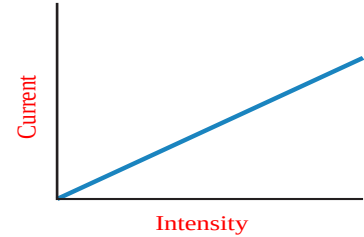
Constant Intensity



Constant Frequency < Threshold Frequency



Constant Frequency ≥ Threshold Frequency



Einstein_AE
اينشتاين العرب

أ/ عبدالرحمن عصام عيد
Mr. Abdelrahman Esam Eid



0509886279



@Einsteinabdo

#Einstein_AE

مناهج الامارات

Reading Photoelectric Graphs

Every photoelectric graph is a **straight line** of the form $y = mx + b$. Match the equation of the graph with $y = mx + b$ to find what the **slope**, the **x-intercept** and the **y-intercept** represent.

Graph	Equation	Slope	x-intercept	y-intercept
KE_{max} (J) against f	$KE = hf - hf_0$	h	f_0	$-W$
ΔV (or KE in eV) against f	$\Delta V = \frac{h}{e}f - \frac{h}{e}f_0$	$\frac{h}{e}$	f_0	$-\frac{W}{e}$
KE_{max} (J) against $\frac{1}{\lambda}$	$KE = \frac{hc}{\lambda} - \frac{hc}{\lambda_0}$	hc	$\frac{1}{\lambda_0}$	$-W$
ΔV (or KE in eV) against $\frac{1}{\lambda}$	$\Delta V = \frac{hc}{e\lambda} - \frac{hc}{e\lambda_0}$	$\frac{hc}{e}$	$\frac{1}{\lambda_0}$	$-\frac{W}{e}$

Remember

The slope is the **same for every metal**, because it depends only on the constants h , c and e .

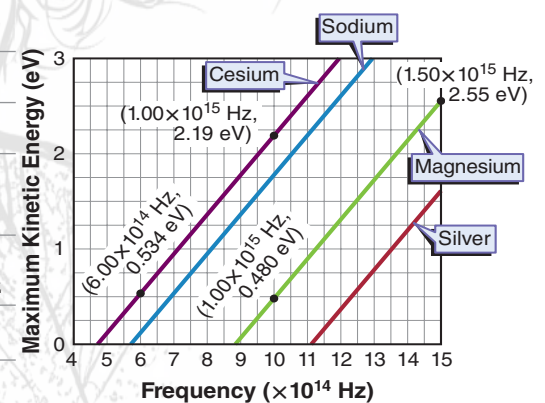
A metal with a **larger work function** gives a **parallel** line shifted to the right (larger f_0 , smaller λ_0).

Use $h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s}$, $c = 3.0 \times 10^8 \text{ m/s}$, $e = 1.6 \times 10^{-19} \text{ C}$.

Slope of a Line The lines in Figure are parallel. That means they all have the same slope. Below are the calculations for cesium and magnesium.

Math	Physics	
	Cesium	Magnesium
$(x_1, y_1), (x_2, y_2)$	$(6.00 \times 10^{14} \text{ Hz}, 0.534 \text{ eV}), (1.00 \times 10^{15} \text{ Hz}, 2.19 \text{ eV})$	$(1.00 \times 10^{15} \text{ Hz}, 0.480 \text{ eV}), (1.50 \times 10^{15} \text{ Hz}, 2.55 \text{ eV})$
$m = \frac{y_2 - y_1}{x_2 - x_1}$	$m = \frac{2.19 \text{ eV} - 0.534 \text{ eV}}{1.00 \times 10^{15} \text{ Hz} - 6.00 \times 10^{14} \text{ Hz}}$	$m = \frac{2.55 \text{ eV} - 0.480 \text{ eV}}{1.50 \times 10^{15} \text{ Hz} - 1.00 \times 10^{15} \text{ Hz}}$
	$m = 4.14 \times 10^{-15} \text{ eV/Hz}$	$m = 4.14 \times 10^{-15} \text{ eV/Hz}$

Maximum Kinetic Energy v. Frequency



All lines in Figure 9 have a slope of $4.14 \times 10^{-15} \text{ eV/Hz}$. When converted to J/Hz , this value becomes the familiar value of Planck's constant:

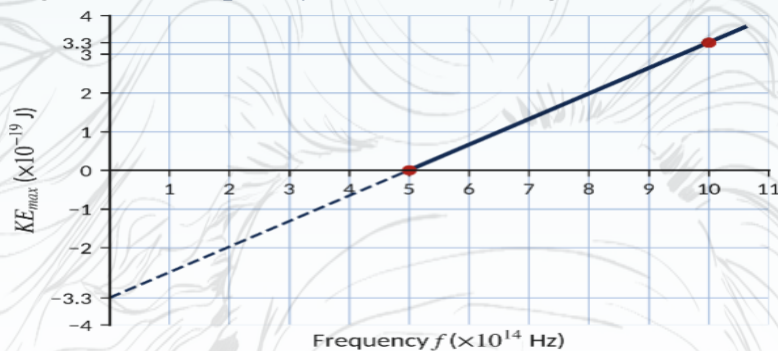
$$4.14 \times 10^{-15} \frac{\text{eV}}{\text{Hz}} \left(\frac{1.602 \times 10^{-19} \text{ J}}{1 \text{ eV}} \right) = 6.63 \times 10^{-34} \text{ J/Hz}$$

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Practice: photoelectric graphs

Q1 The graph shows the **maximum kinetic energy** of photoelectrons emitted from a metal surface against the **frequency** of the incident light.



Answer

(a) Calculate the **slope** of the graph. What does the slope **represent**?

(b) Determine the **threshold frequency** of the metal and its **work function** in joules and in electron volts.

(c) Calculate the **threshold wavelength** of the metal.

(d) Find the maximum kinetic energy of the photoelectrons when light of frequency 8.0×10^{14} Hz falls on the metal.

(e) At what **wavelength** of incident light is the maximum kinetic energy equal to 3.3×10^{-19} J?

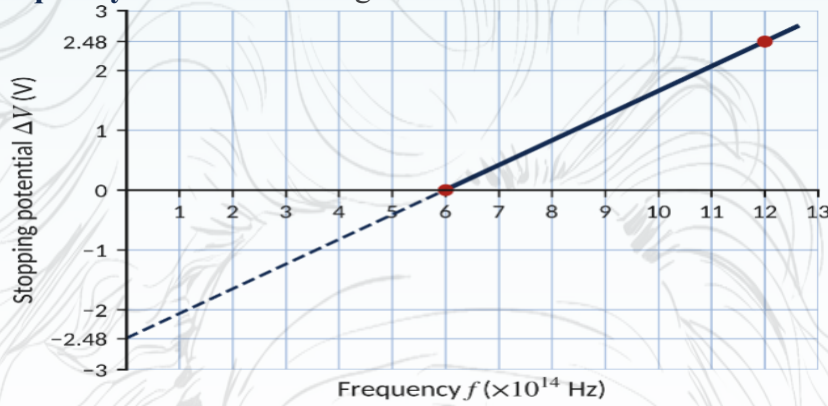
(f) The experiment is repeated with a metal of **larger work function**.

How does the graph change? Explain.

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Q2 The graph shows the **stopping potential** ΔV of photoelectrons emitted from a metal against the **frequency** of the incident light.



Answer

(a) Calculate the **slope** of the graph. What does it **represent**?

Use it to calculate **Planck's constant**.

(b) From the graph, determine the **threshold frequency** and the **work function** of the metal in eV.

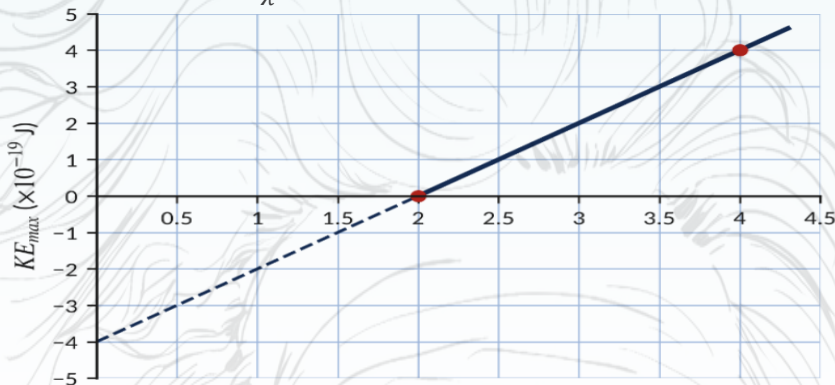
(c) Calculate the **threshold wavelength** of the metal.

(d) Light of wavelength 300 nm falls on the metal. Find the **stopping potential** and the **maximum kinetic energy** of the photoelectrons in eV and in joules.

(e) At what **wavelength** of incident light is the maximum kinetic energy equal to 2.48 eV?

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Q3 The graph shows the **maximum kinetic energy** of photoelectrons against the **reciprocal of the wavelength** $\frac{1}{\lambda}$ of the incident light.



Answer

(a) Calculate the **slope** of the graph. What does it **represent**?

Use it to calculate **Planck's constant**.

(b) Determine the **threshold wavelength** and the **threshold frequency** of the metal.

(c) Determine the **work function** of the metal in joules and in electron volts.

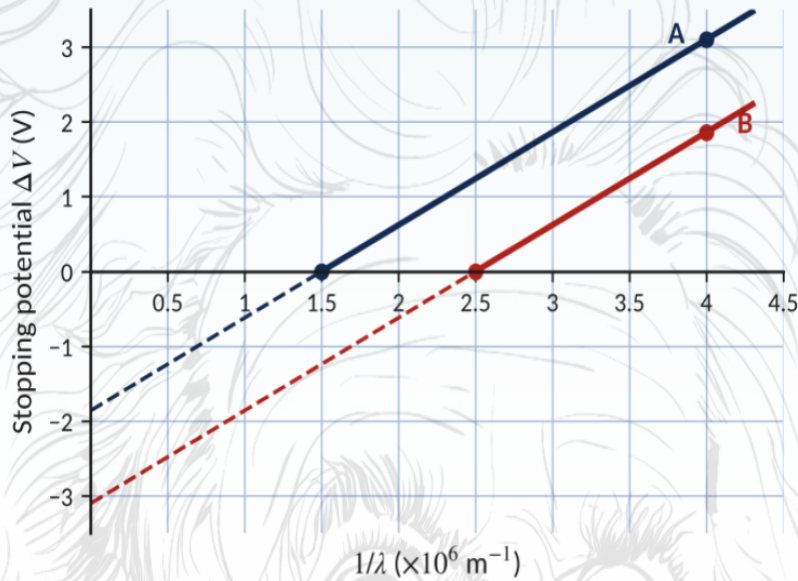
(d) Calculate the maximum kinetic energy of the photoelectrons when light of wavelength 400 nm is used.

(e) At what **wavelength** is the maximum kinetic energy equal to $2.0 \times 10^{-19} \text{ J}$?

(f) Explain why **no photoelectrons** are emitted when light of wavelength 600 nm falls on the metal, even if its intensity is very high.

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Q4 The graph shows the **stopping potential** against $\frac{1}{\lambda}$ for two metals, A and B.



Answer

(a) Calculate the **slope** of each line.

What does the slope **represent**, and why are the two lines **parallel**?

(b) Determine the **threshold wavelength** of each metal. Which metal has the **larger work function**? Calculate it in eV.

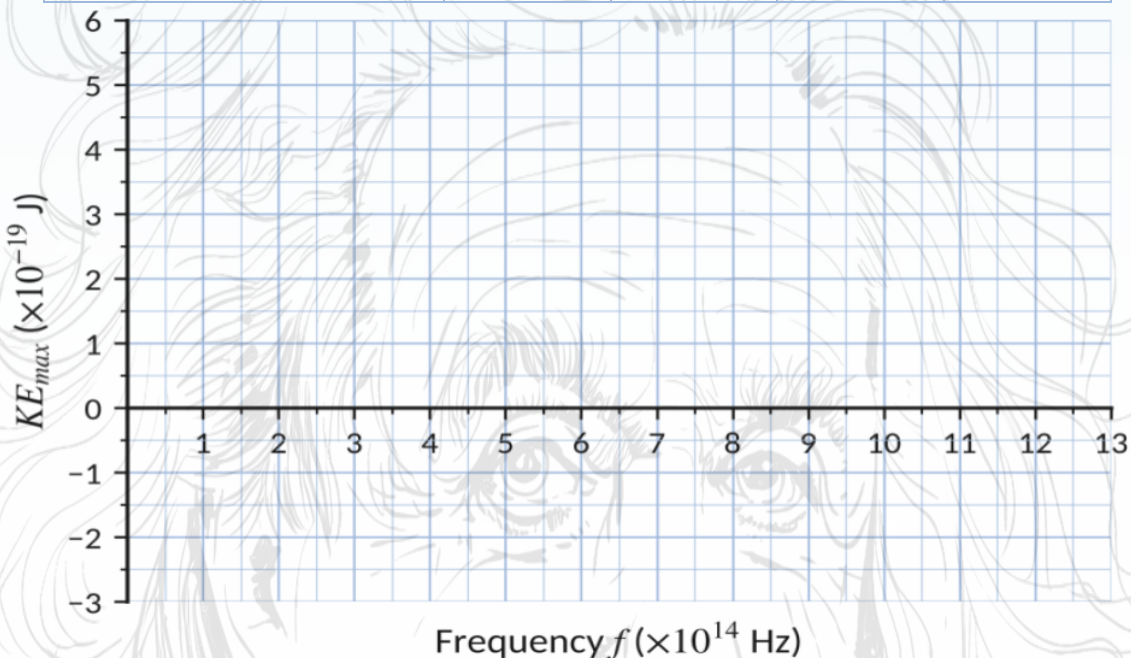
(c) Light of wavelength 500 nm falls on both metals. Which metal emits photoelectrons? Find their **maximum kinetic energy** in eV.

(d) For metal A, at what **wavelength** of incident light is the stopping potential equal to 1.24 V?

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Q5 In a photoelectric experiment, a student measured the **maximum kinetic energy** of the photoelectrons for different **frequencies** of incident light:

Frequency f ($\times 10^{14}$ Hz)	6	8	10	12
KE_{max} ($\times 10^{-19}$ J)	1.3	2.6	4.0	5.3



Answer

(a) **Plot** the points on the grid and draw the **best straight line**.

Extend the line until it cuts **both axes**.

(b) From your graph, find the **threshold frequency** of the metal, then calculate its **threshold wavelength**.

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.....

(c) Calculate the **slope** of the line. What does the slope **represent**?

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(d) Read the **y-intercept** and find the **work function** of the metal in joules and in eV.

.....

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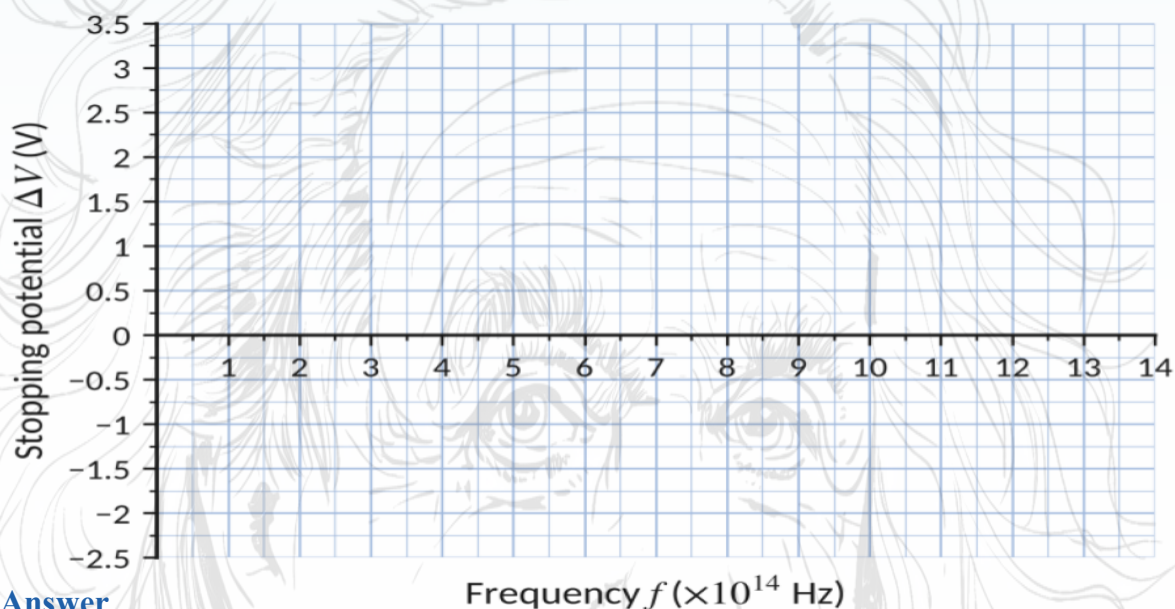
(e) From the graph, find the maximum kinetic energy when light of frequency 9×10^{14} Hz is used.

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Q6 In another experiment, the **stopping potential** was measured for different **frequencies** of incident light:

Frequency $f (\times 10^{14} \text{ Hz})$	7	9	11	13
Stopping potential $\Delta V (\text{V})$	0.8	1.7	2.5	3.3



Answer

- (a) **Plot** the points on the grid, draw the **best straight line** and extend it to cut **both axes**.
 (b) Find the **threshold frequency** and the **threshold wavelength** of the metal.

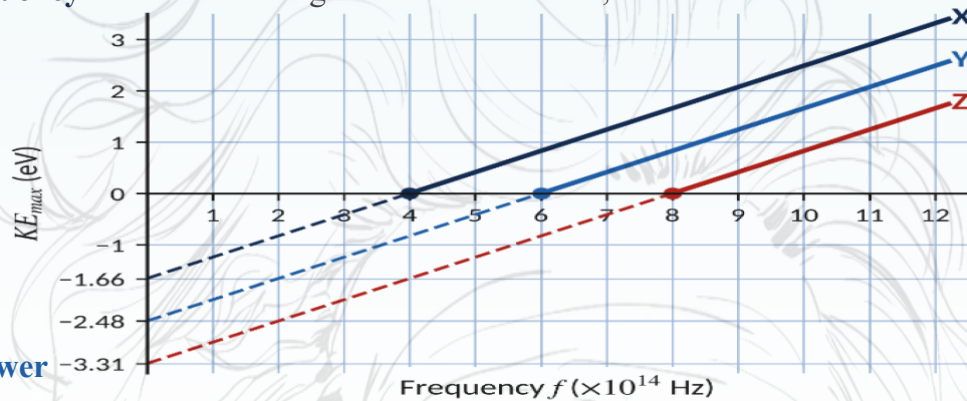
- (c) Calculate the **slope** of the line. What does it **represent**? Use it to calculate **Planck's constant**.

- (d) Find the **work function** of the metal in eV.

- (e) What is the **stopping potential** when light of frequency $10 \times 10^{14} \text{ Hz}$ is used?

- (f) At what **wavelength** of incident light is the stopping potential equal to 1.24 V?

Q7 The graph shows the **maximum kinetic energy** of photoelectrons against the **frequency** of the incident light for three metals X, Y and Z.



Answer

(a) Why are the three lines **parallel**? What does their common **slope** represent?

(b) Which metal gives electrons with the **largest kinetic energy**, and how large is it?

(c) Calculate the **threshold wavelength** of each metal.

(d) Light of frequency 7×10^{14} Hz falls on the three metals.

Which metals emit photoelectrons?

(e) Light of wavelength 400 nm falls on the three metals.

Which metals emit photoelectrons? Explain.

(f) For metal Y, at what **wavelength** of incident light is the maximum kinetic energy equal to 1.24 eV?