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FIZIK!

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PHYSICS

BY CHAPTER F4 & F5

F5 CH7: QUANTUM PHYSICS

COMPILATION OF **OBJECTIVE** QUESTIONS




**DREAM BIG
AIM HIGH
NEVER GIVE UP**

alinainanarif

TING. 5: BAB 7 FIZIK KUANTUM (QUANTUM PHYSICS)

1 Apakah yang dimaksudkan dengan kesan fotoelektrik?

What is meant by the photoelectric effect?

- A Frekuensi maksimum pancaran yang ditujukan untuk melepaskan elektron dari permukaan logam
The maximum frequency of the incident radiation at releasing electrons from the metal surface
- B** Apabila permukaan logam diterangi oleh pancaran cahaya pada frekuensi tertentu, elektron boleh dipancarkan daripada logam itu
When a metal surface is illuminated by a beam of light at a certain frequency, electrons can be emitted from the metal
- C Tenaga kinetik maksimum fotoelektron
The maximum kinetic energy of a photoelectron
- D Pemalar Plank
Plank's constant

2 Rajah 1 menunjukkan graf $E_{k_{maks}}$ melawan frekuensi.

Diagram 1 shows a graph of $E_{k_{maks}}$ against frequency.

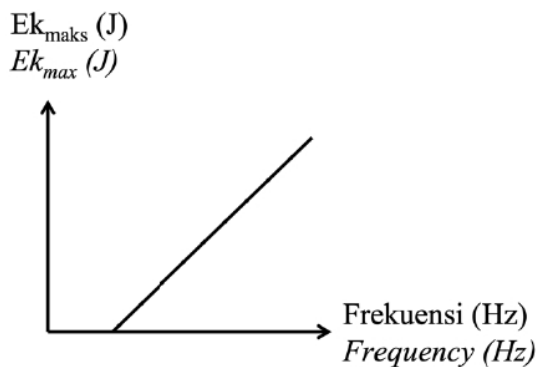


Diagram 1

Apakah yang diwakili pintasan-x?

What does x-intercept represent?

- A Tenaga minimum
Minimum energy
- B** Frekuensi ambang
Threshold frequency
- C Tenaga kinetik maksimum
Maximum kinetic energy
- D Frekuensi maksimum
Maximum frequency

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- 3 Bagaimanakah tenaga foton berubah jika panjang gelombang cahaya dikurangkan?
How does the energy of a photon change if the wavelength of light is reduced?
- A Berkurang *Decreases*
 - B Tidak berubah *Stays the same*
 - C** Meningkatkan *Increases*
- 4 Tenaga foton yang dipancarkan ke atas suatu permukaan logam dalam proses kesan fotoelektrik ialah 2.26 eV. Hitung frekuensi foton ini.
The energy of photon that incidents to the surface of a metal in a process of photoelectric effect is 2.26 eV. Calculate the frequency of this photon.
[1 eV = 1.6×10^{-19} J]
- A 5.45×10^{13} Hz
 - B** 5.45×10^{14} Hz
 - C 5.45×10^{15} Hz
 - D 5.45×10^{16} Hz
- 5 Mengapakah jasad hitam dikenali sebagai satu jasad unggul?
Why is the black body known as an ideal body?
- A Membenarkan sinaran yang masuk ke dalamnya dipantulkan berulang kali
Allowing rays that enter it to be reflected over and over again
 - B Permukaannya berwarna gelap
The surface is dark
 - C** Mampu menyerap semua sinaran elektromagnet yang jatuh ke atasnya
Able to absorb all electromagnetic radiations that fall on it
 - D Memancarkan sinaran pada pelbagai suhu
Emits radiation at various temperatures
- 6 Satu foton yang bergerak dengan kelajuan $3.0 \times 10^6 \text{ m s}^{-1}$ menyamai momentum satu elektron. Berapakah panjang gelombang de Broglie bagi foton tersebut?
A photon that moves with a speed of $3.0 \times 10^6 \text{ m s}^{-1}$ is equal to the momentum of one electron. What is the de Broglie wavelength of the photon?
- A** 2.46×10^{-10} m
 - B 3.64×10^{-10} m
 - C 1.31×10^{-13} m
 - D 2.42×10^{-12} m

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- 10 Rajah 2 menunjukkan graf perubahan panjang gelombang de Broglie, λ melawan momentum, p suatu elektron.

Diagram 2 shows a graph of the change in de Broglie wavelength, λ against momentum, p of an electron.

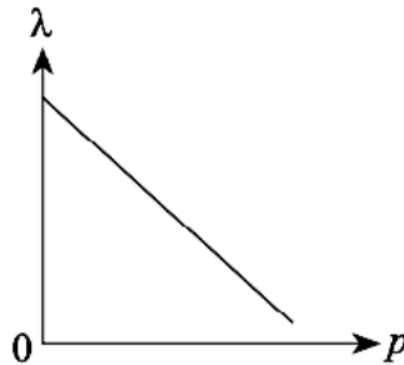


Diagram 2

Antara berikut, yang manakah penerangan terbaik bagi graf di atas?

Which of the following is the best description for the graph above?

- A Semakin besar momentum, semakin panjang panjang gelombang de Broglie
The greater the momentum, the longer the de Broglie wavelength
 - B Semakin kecil momentum, semakin pendek panjang gelombang de Broglie
The smaller the momentum, the shorter the de Broglie wavelength
 - C Panjang gelombang zarah tidak bergantung kepada momentumnya
The wavelength of a particle is independent upon its momentum
 - D** Panjang gelombang zarah bergantung kepada momentumnya
The wavelength of a particle is dependent upon its momentum
- 11 Rajah 3 menunjukkan kesan fotoelektrik pada suatu permukaan logam.
Diagram 3 shows the photoelectric effect on a metal surface.

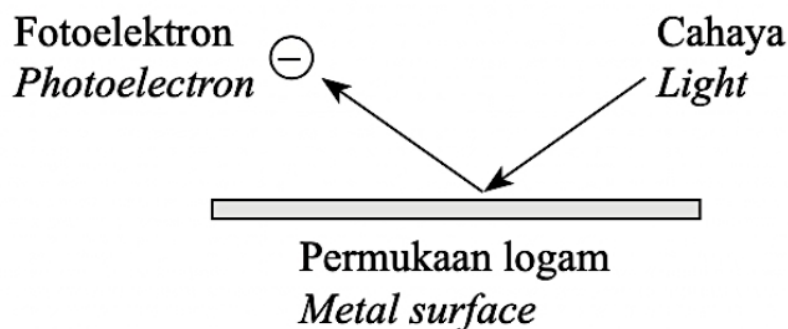


Diagram 3

Pemancaran fotoelektron berlaku apabila
The emission of photoelectrons occurs when

- A fungsi kerja logam meningkat
the work function of metal increases
- B keamatan cahaya bertambah
the intensity of light increases
- C** panjang gelombang cahaya lebih pendek daripada panjang gelombang ambang logam
the wavelength of light is shorter than the threshold wavelength of metal
- D frekuensi cahaya lebih rendah daripada frekuensi ambang logam
the frequency of light is smaller than the threshold frequency of metal

12 Antara berikut, yang manakah merupakan aplikasi kesan fotoelektrik?
Which of the following are the applications of photoelectric effect?

- | | |
|----------------------------------------------------|-----------------------------------------------------------------------|
| A Panel solar
<i>Solar panels</i> | C Loceng elektrik di sekolah
<i>Electric bell in school</i> |
| B Seterika elektrik
<i>Electric iron</i> | D Transformer
<i>Transformer</i> |

13 Logam aluminium mempunyai fungsi kerja 6.54×10^{-19} J dan disinari dengan cahaya yang mempunyai panjang gelombang 3×10^{-7} m.
 Berapakah tenaga kinetik maksimum fotoelektron yang terpancar?
An aluminum metal has a work function of 6.54×10^{-19} J and is illuminated with a light that has a wavelength of 3×10^{-7} m.

What is the maximum kinetic energy of the emitted photoelectrons?

[Laju cahaya dalam vakum, $c = 3.00 \times 10^8$ m s⁻¹]

[Speed of light in vacuum, $c = 3.00 \times 10^8$ m s⁻¹]

- | | |
|-----------------------------------|-----------------------------------|
| A 6.63×10^{-21} J | C 6.63×10^{-19} J |
| B 9.00×10^{-21} J | D 9.00×10^{-19} J |

14 Elektron mempunyai sifat kedualan gelombang-zarah.
Electrons have wave-particle duality.

Kenyataan ini disebabkan oleh elektron
This statement is due to electrons

- A** menunjukkan sifat zarah dan sifat gelombang / *exhibit the properties of particles and waves*
- B** merambat dengan kelajuan cahaya / *travel at the speed of light*
- C** mempunyai dua gelombang berlainan / *have two different waves*
- D** bergabung dengan neutron dengan mudah / *combine with neutrons easily*

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- 15 Bagaimanakah tenaga foton berubah jika panjang gelombang cahaya digandakan?
How does the energy of a photon change if the wavelength of light is doubled?
- A Tenaga bertambah 4 kali ganda. / *Energy increases 4 times.*
 - B Tenaga bertambah 2 kali ganda. / *Energy increases 2 times.*
 - C** Tenaga berkurang separuh. / *Energy is reduced to half.*
 - D Tenaga tidak berubah. / *Energy unchanged.*
- 16 Antara berikut, pernyataan yang manakah yang benar tentang frekuensi ambang?
Which of the following statement is true about the threshold frequency?
- A Frekuensi maksimum foton cahaya yang menghasilkan kesan fotoelektrik
Maximum frequency for a light photon to produce photoelectric effect.
 - B Semua logam mempunyai nilai frekuensi ambang yang sama
All metals have the same value of threshold frequency
 - C Nilai frekuensi ambang ialah nilai kecerunan K_{maks} melawan f .
The value of threshold frequency is the value of the gradient of graph of K_{max} against f .
 - D** Semakin tinggi frekuensi ambang, semakin tinggi nilai fungsi kerja
The higher the threshold frequency, the higher the work function
- 17 Apakah idea yang telah diperkenalkan oleh Louis de Broglie?
What ideas was introduced by Louis de Broglie?
- A Memperkenalkan idea kuantum iaitu tenaga yang diskrit
Introducing the idea of quantum which is discrete energy
 - B Menerangkan penghasilan spektrum garis oleh atom hydrogen
Explain the production of line spectrum by hydrogen atoms
 - C Memperkenalkan konsep foton dan menjelaskan ciri-ciri kesan fotoelektrik
Introduce the concept of photons and explain the characteristics of the photoelectric effect
 - D** Memperkenalkan zarah bersifat gelombang dan idea sifat kedualan gelombang-zarah
Introduce wave nature of particle and the idea of wave-particle duality
- 18 Apakah yang dimaksudkan dengan fungsi kerja?
What is the meaning of work function?
- A Frekuensi yang menentukan warna bagi sebuah cahaya
Frequency that determines the colour of the light
 - B Frekuensi yang menentukan sifat kedualan gelombang-zarah
Frequency that determines the wave-particle duality
 - C Keamatan cahaya yang akan menentukan tenaga kinetik elektrik
Intensity of light that will determine the kinetic energy of electron
 - D** Tenaga minimum yang diperlukan untuk fotoelektron terlepas dari permukaan logam
Minimum energy required for photoelectron to be emitted from a metal surface

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21 Pernyataan-pernyataan berikut menerangkan ciri-ciri kesan fotoelektrik.
The following statements explain the characteristic of photoelectric effect.

- I Semakin tinggi frekuensi foton cahaya, semakin tinggi tenaga kinetik fotoelektron yang dipancarkan daripada permukaan logam
The higher the frequency of the light photon, the higher the kinetic energy of the photoelectrons emitted from the metal surface
- II Frekuensi ambang, f bagi sesuatu logam ialah frekuensi minimum yang dapat memancarkan elektron
The threshold frequency, f of a metal is the minimum frequency of light needed to emit electrons
- III Tenaga kinetik fotoelektron tidak bergantung pada keamatan cahaya
The kinetic energy of photoelectrons does not depend on the intensity of light
- IV Fototelektron dipancarkan serta-merta apabila permukaan logam disinari cahaya
Photoelectrons are emitted instantaneously when a metal surface is illuminated by light

Pilih pernyataan yang betul mengenai ciri-ciri kesan fotoelektrik.
Choose the correct statement about the characteristics of the photoelectric effect.

- A I dan II sahaja
- B II dan III sahaja
- C I, II dan III sahaja
- D** I, II, III dan IV

22 Tenaga kinetik fotoelektron bertambah apabila
The kinetic energy of photoelectrons increases when

- A frekuensi foton cahaya berkurang
frequency of photon of light decreases
- B** frekuensi foton cahaya bertambah
frequency of photon of light increases
- C keamatan cahaya berkurang
intensity of light decreases
- D keamatan cahaya bertambah
intensity of light increases

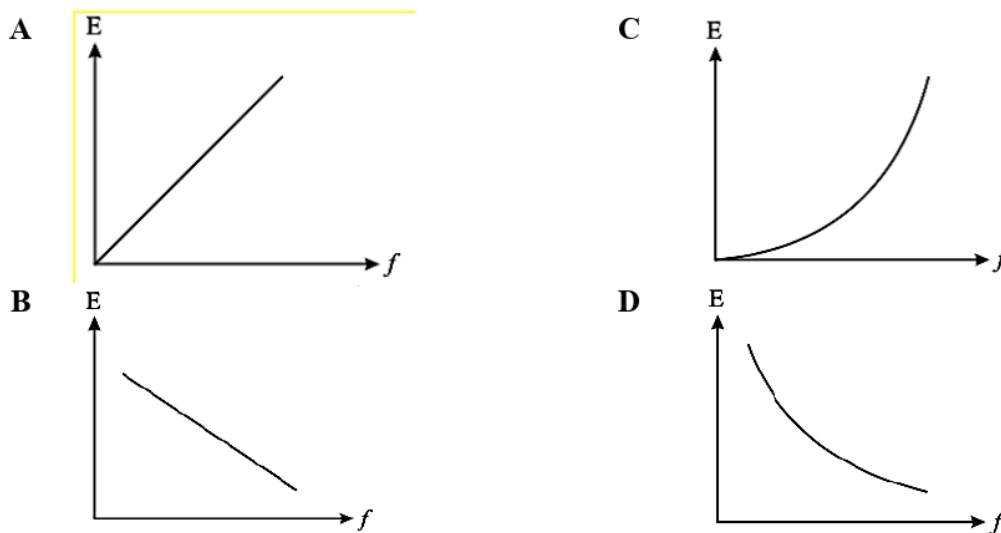
TING. 5: BAB 7 FIZIK KUANTUM (QUANTUM PHYSICS)

- 23 Sebuah lampu 100 W memancarkan cahaya dengan panjang gelombang 440 nm. Berapakah bilangan foton yang dipancarkan per saat?
*A 100 W lamp emits light with a wavelength of 440 nm.
 What is the number of photons emitted per second?*

[Pemalar Planck, $h = 6.63 \times 10^{-34} \text{ Js}$, laju cahaya, $c = 3.00 \times 10^8 \text{ ms}^{-1}$]
 [Planck's constant, $h = 6.63 \times 10^{-34} \text{ Js}$, speed of light, $c = 3.00 \times 10^8 \text{ ms}^{-1}$]

- A** $2.21 \times 10^{20} \text{ s}^{-1}$ **C** $4.52 \times 10^{20} \text{ s}^{-1}$
B $3.42 \times 10^{20} \text{ s}^{-1}$ **D** $5.38 \times 10^{20} \text{ s}^{-1}$

- 24 Graf yang manakah mewakili dengan betul hubungan tenaga, E satu foton cahaya dengan frekuensi, f?
Which graph correctly represents the relationship of the energy, E of a light photon with the frequency, f?



- 25 Suatu foton bagi gelombang elektromagnet mempunyai momentum menyamai elektron yang bergerak pada kelajuan $2.0 \times 10^6 \text{ ms}^{-1}$. Apakah panjang gelombang de Broglie bagi foton tersebut?
*A photon of electromagnetic wave has the same momentum with an electron which move the speed of $2.0 \times 10^6 \text{ ms}^{-1}$.
 What is the de Broglie wavelength of the photon?*
 [Jisim elektron = $9.1 \times 10^{-31} \text{ kg}$] [Mass of eletron = $9.1 \times 10^{-31} \text{ kg}$]

- A** $2.75 \times 10^9 \text{ m}$ **C** $3.64 \times 10^{-10} \text{ m}$
B $6.86 \times 10^{-4} \text{ m}$ **D** $3.33 \times 10^{-10} \text{ m}$

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- 29 Suatu cahaya monokromatik dengan frekuensi, f ditujukan kepada permukaan logam yang mempunyai fungsi kerja W . Fotoelektron yang berjisim m dibebaskan mematuhi persamaan fotoelektrik Einstein $\frac{1}{2}mv^2 = hf - W$.

Simbol ' v ' mewakili

A monochromatic light with a frequency, f is directed at a metal surface with a work function W .

A photoelectron of mass m is released obeying Einstein's photoelectric equation $\frac{1}{2}mv^2 = hf - W$.

The symbol ' v ' represents

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A Laju purata fotoelektron
<i>average speed of photoelectrons</i></p> <p>B jumlah laju fotoelektron
<i>total speed of photoelectrons</i></p> | <p>C laju maksimum fotoelektron
<i>maximum speed of photoelectrons</i></p> <p>D laju minimum fotoelektron
<i>minimum speed of photoelectrons</i></p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- 30 Apabila suatu bahan fotoelektrik dipancarkan dengan cahaya biru yang mempunyai panjang gelombang, $\lambda = 452$ nm, satu fotoelektron dengan 0.75 eV dipancarkan.

When a photoelectric material is shone with blue light having a wavelength, $\lambda = 452$ nm, a photoelectron with 0.75 eV is emitted.

Apakah panjang gelombang ambang bahan fotoelektrik itu?

What is the threshold wavelength of the photoelectric material?

[Diberikan $hc = 1.243 \times 10^3$ eV nm]

[Given $hc = 1.243 \times 10^3$ eV nm]

- | | |
|----------------------------------------------------|----------------------------------------------------|
| <p>A 452.0 nm</p> <p>B 1205.3 nm</p> | <p>C 621.5 nm</p> <p>D 1657.3 nm</p> |
|----------------------------------------------------|----------------------------------------------------|

- 31 Antara pasangan berikut yang manakah betul menunjukkan contoh bagi sinaran yang dipancarkan oleh suatu objek?

Which of the following pairs correctly shows an example of radiation emitted by an object?

	Suhu objek rendah <i>Low temperature object</i>	Suhu objek tinggi <i>High temperature object</i>
A	Gelombang mikro <i>Microwave</i>	Gelombang radio <i>Radiowave</i>
B	Sinaran ultraungu <i>Ultraviolet</i>	Gelombang mikro <i>Microwave</i>
C	Gelombang radio <i>Radiowave</i>	Cahaya nampak <i>Visible light</i>
D	Sinaran ultraungu <i>Ultraviolet</i>	Cahaya nampak <i>Visible light</i>

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- 32 Semua objek dapat memancarkan sinaran elektromagnet. Frekuensi sinaran elektromagnet bergantung pada suhu objek tersebut.

Antara pasangan berikut yang manakah benar?

All objects can emit electromagnetic radiation. The frequency of electromagnetic radiation depends on the temperature of the object.

Which of the following pairs is true?

	Suhu objek <i>Temperature of object</i>	Frekuensi sinaran elektromagnet yang terpancar <i>The frequency of electromagnetic radiation emitted</i>
A	Tinggi / <i>High</i>	Tinggi / <i>High</i>
B	Rendah / <i>Low</i>	Tinggi / <i>High</i>
C	Tinggi / <i>High</i>	Rendah / <i>Low</i>

- 33 Rajah 6 menunjukkan susunan radas dalam suatu aktiviti makmal.

Diagram 6 shows the arrangement of the apparatus in a laboratory activity.

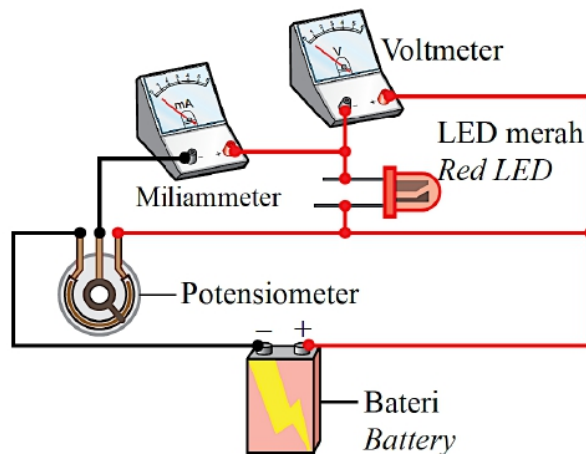


Diagram 6

Apakah fungsi susunan tersebut?

What is the function of the arrangement?

- A** Untuk menentukan panjang gelombang LED Merah.
To determine the wavelength of the Red LED.
- B** Untuk menentukan nilai pemalar Planck
To determine the value of the Planck's constant
- C** Untuk menentukan frekuensi ambang
To determine the threshold frequency
- D** Untuk menunjukkan hubungan di antara arus dan beza keupayaan
To show the relationship between current and potential difference

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- 34 Rajah 7 menunjukkan cahaya hijau dengan panjang gelombang 550 nm disinari pada permukaan logam sodium.

Diagram 7 shows a green light with a wavelength of 550 nm irradiated on the surface of sodium metal.



Diagram 7

Mengapakah tiada elektron yang dipancarkan dari permukaan sodium?

Why are no electrons emitted from the surface of sodium?

- A Keamatan cahaya hijau tidak mencukupi
The intensity of the green light is insufficient
 - B** Frekuensi cahaya hijau tidak melebihi frekuensi ambang logam sodium
The frequency of green light does not exceed the threshold frequency of sodium metal
 - C Panjang gelombang cahaya yang digunakan terlalu kecil
The wavelength of the light used is too small
 - D Tenaga kinetic elektron tidak mencukupi
The kinetic energy of electrons is insufficient
- 35 Rajah 8.1 menunjukkan proses pancaran termion.
Rajah 8.2 menunjukkan kesan fotoelektrik.
Diagram 8.1 shows the process of thermionic radiation.
Diagram 8.2 shows the photoelectric effect.

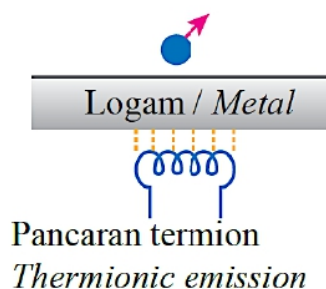


Diagram 8.1

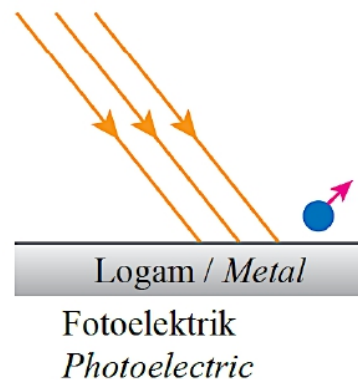


Diagram 8.2

TING. 5: BAB 7 FIZIK KUANTUM (QUANTUM PHYSICS)

Antara berikut manakah yang betul tentang masa pengeluaran elektron daripada permukaan logam?
Which of the following is correct about the time taken for electron to release from a metal surface?

	Pancaran termion <i>Thermionic emission</i>	Fotoelektrik <i>Photoelectric</i>
A	Mengambil masa yang lama <i>Take some time</i>	Mengambil masa yang lama <i>Take some time</i>
B	Mengambil masa yang lama <i>Take some time</i>	Berlaku secara serta-merta <i>Instantaneously</i>
C	Berlaku secara serta-merta <i>Instantaneously</i>	Mengambil masa yang lama <i>Take some time</i>
D	Berlaku secara serta-merta <i>Instantaneously</i>	Berlaku secara serta-merta <i>Instantaneously</i>

36 Apakah yang berlaku kepada elektron apabila menerima tenaga daripada foton pada frekuensi ambang, f_0 ?

What happens to an electron when it receives energy from a photon at a threshold frequency, f_0 ?

- A** Elektron tidak dikeluarkan
Electrons are not released
- B** Elektron dikeluarkan sekejap kemudian diserap semula ke dalam logam
Electrons are released momentarily then reabsorbed into the metal
- C** Elektron dikeluarkan tanpa sebarang tenaga kinetik
Electrons are released without any kinetic energy
- D** Elektron hanya bergetar pada kedudukan tetap sahaja.
Electrons only vibrate at fixed positions.

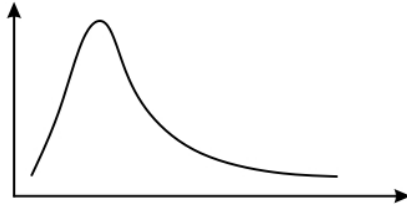
37 Dua foton cahaya P dan Q masing-masing mempunyai panjang gelombang 400 nm dan 750 nm. Perbandingan manakah yang betul mengenai tenaga yang dimiliki oleh cahaya tersebut?

The two photons of light P and Q have wavelengths of 400 nm and 750 nm, respectively. Which comparison is correct about the energy possessed by the light?

- A** $P > Q$
- B** $P < Q$
- C** $P = Q$

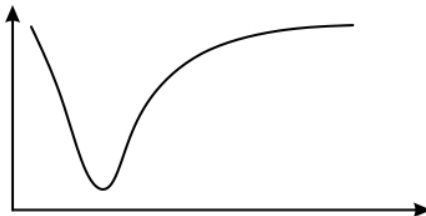
38 Antara graf keamatan cahaya melawan panjang gelombang berikut, manakah yang betul?
Which of the following graphs of light intensity against wavelength is correct?

A Keamatan cahaya
Intensity of light



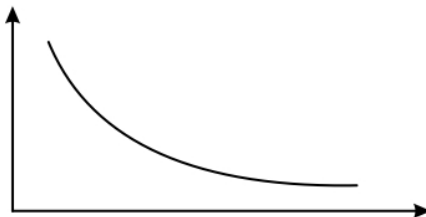
Panjang gelombang
Wavelength

B Keamatan cahaya
Intensity of light



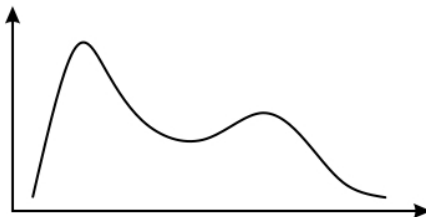
Panjang gelombang
Wavelength

C Keamatan cahaya
Intensity of light



Panjang gelombang
Wavelength

D Keamatan cahaya
Intensity of light



Panjang gelombang
Wavelength

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- 39 Sebuah lampu merkuri boleh menghasilkan cahaya berwarna ungu dan dan hijau masing-masing dengan frekuensi 7.41×10^{14} Hz dan 5.49×10^{14} Hz.

A mercury lamp may produce purple and green light with frequencies 7.41×10^{14} Hz and 5.49×10^{14} Hz , respectively.

Perbandingan manakah yang betul mengenai tenaga yang dimiliki oleh cahaya berwarna ungu dan hijau?

Which comparison is correct about the energy possessed by purple and green light

- A Tenaga cahaya ungu = tenaga cahaya hijau
Purple light energy = green light energy
 - B Tenaga cahaya ungu < tenaga cahaya hijau
Purple light energy < green light energy
 - C** Tenaga cahaya ungu > tenaga cahaya hijau
Purple light energy > green light energy
- 40 Cahaya adalah sinaran elektromagnet yang memiliki sifat kedualan gelombang-zarah. Antara pasangan berikut, yang manakah menerangkan sifat kedualan cahaya?
Light is electromagnetic radiation that has the nature of wave-particle duality. Which of the following pairs describes the dual nature of light?

	Sifat gelombang <i>Waves property</i>	Sifat zarah <i>Particle property</i>
A	Menunjukkan fenomena pembelauan dan interferens <i>Exhibits the phenomenon of diffraction and interference</i>	Menunjukkan fenomena pembiasan dan pantulan <i>Shows the phenomenon of refraction and reflection</i>
B	Terdiri daripada foton <i>Consists of photons</i>	Menunjukkan fenomena pembelauan dan interferens <i>Exhibits the phenomenon of diffraction and interference</i>
C	Menunjukkan fenomena pembelauan dan interferens <i>Exhibits the phenomenon of diffraction and interference</i>	Terdiri daripada foton <i>Consists of photons</i>
D	Mempunyai panjang gelombang <i>Have wavelength</i>	Memiliki momentum dan tenaga kinetik <i>Have momentum and kinetic energy</i>

“When you seek Dunya (world), you lose the Hereafter.

When you seek the Hereafter, you gain both Dunya (world) and the Hereafter.

Which is the wiser transaction?”