Quantum Physics: Review

This is a preview of the draft version of the quiz

Started: Nov 4 at 11:05am

Quiz Instructions

Question 1

1 pts

If all matter were made of electrically neutral particles such as neutrons, then

- [ ] Earth could not move around the sun.
- [ ] it would not be possible to sit on a chair.
- [ ] you would not be able to walk on the road.
- [ ] there would be no tension in a string.

Question 2

1 pts

Which of the following is the correct order of the range of the fundamental forces from longest (left) to shortest (right)?

- [ ] Electromagnetic force, gravitational force, strong force, weak force

- [ ] Strong force, electromagnetic force, gravitational force, weak force
- [ ] Gravitational force, electromagnetic force, weak force, strong force
- [ ] Strong force, gravitational force, electromagnetic force, weak force

Question 3

1 pts

Of the following types of electromagnetic radiation, which has the least amount of energy per photon?

- [ ] visible light
- [ ] UV light
- [ ] infrared
- [ ] gamma

Question 4

1 pts

A very small particle has a mass m and a velocity v. It is found to have a wavelength λ. If a second particle has a mass of 2m and a velocity of 2v, what is the wavelength of the second particle?

- [ ] λ4
- [ ] λ/4

- λ/4
- λ2

Question 5

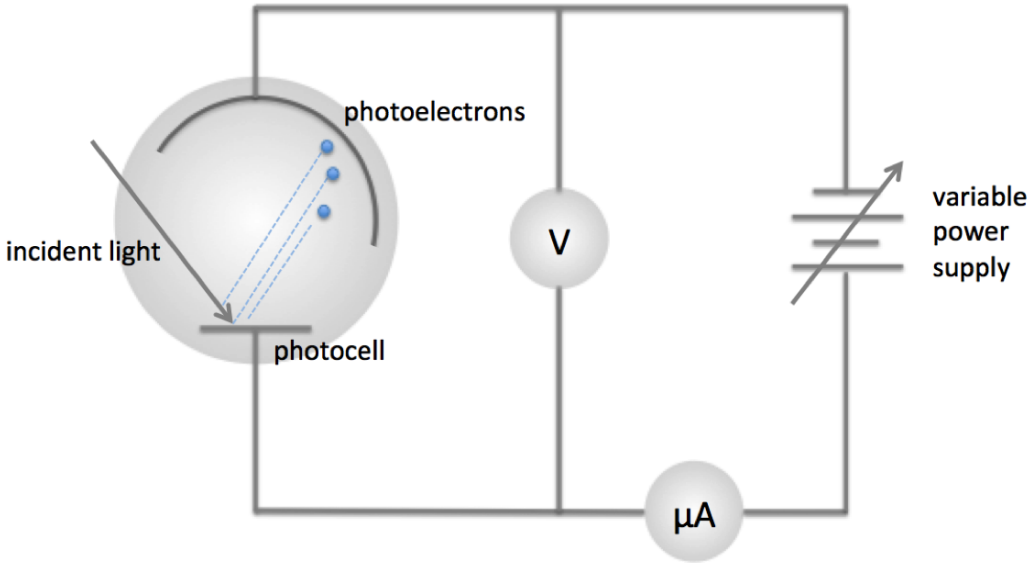
1 pts

Which of the following is best described by the particle-like behavior of light?

- the photoelectric effect
- electromagnetic radiation
- diffraction
- interference

Question 6

1 pts



The circuit above is an example of the apparatus used to conduct photoelectric effect experiments. Incident light shines onto the photocell and frees electrons from the surface. The kinetic energy of the electrons is related to the work function of the photocell and the frequency of the light striking the surface. The ejected electrons strike the receiving surface and can be detected as current in the circuit. The variable power supply is connected in such a way that as the voltage increases, it creates a potential that makes it harder for the electrons to be ejected from the surface and reduces the amount of kinetic energy of the ejected electrons. The voltage can be increased until the photocell stops emitting electrons when the incident light no longer provides enough energy for the electrons to escape. This is known as the stopping potential.

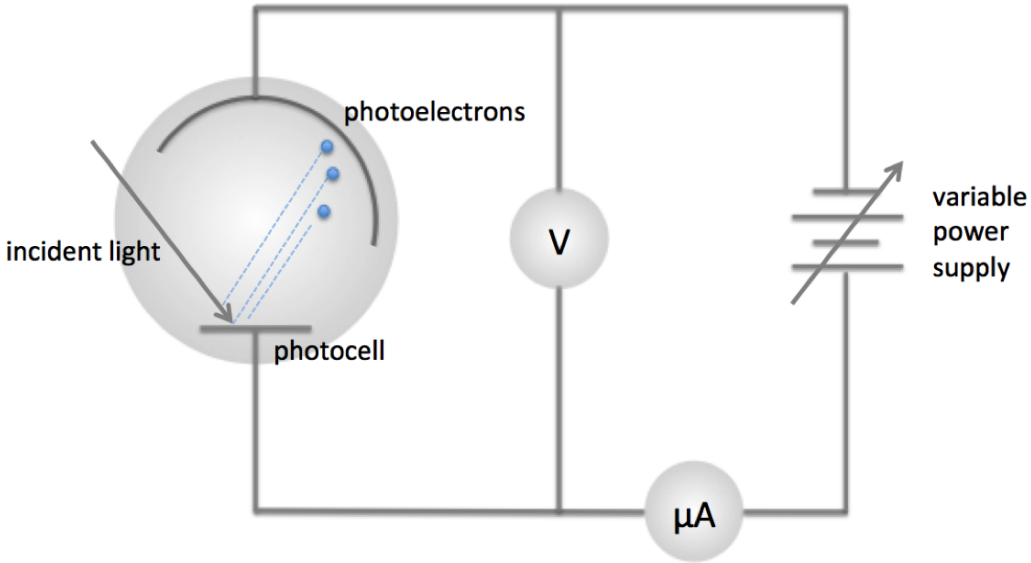
In a photoelectric effect experiment where the incident light has a frequency f and the photocell has a work function Φ, what is the stopping potential V in terms of the given values and any universal constants needed?

- [ ] (hfq−Φ)
- [ ] (hf−Φ)

- [ ] hf
- [ ] (hf−Φ)/q

Question 7

1 pts



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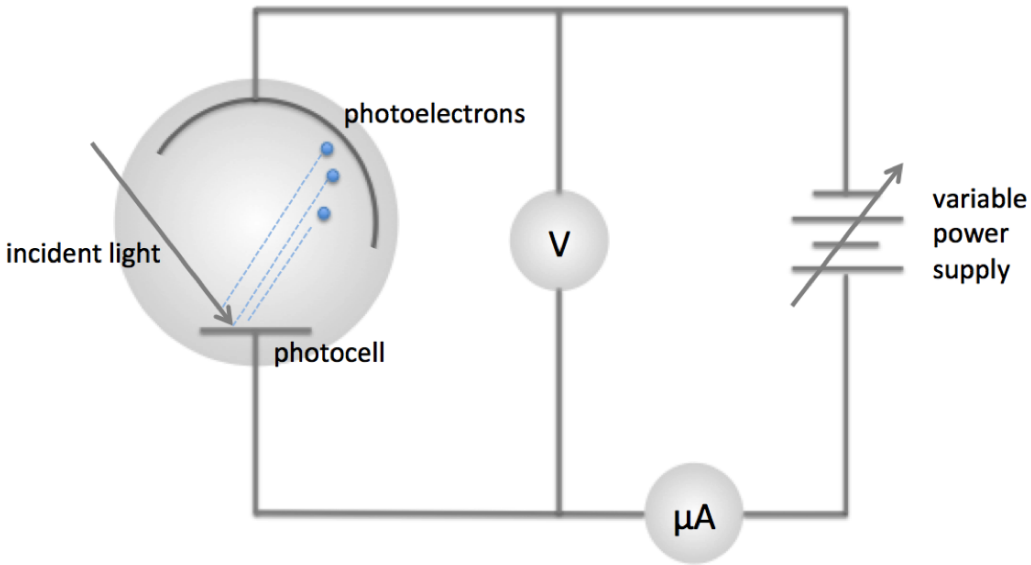
How much energy does an electron have if it is ejected from an aluminum surface (Φ = 4.08 eV) by green light (f = 5.50 x 10^{14} Hz)?

(h = 4.14 x 10^{-15} eV.s)

- [ ] -1.08 eV
- [ ] 4.08 eV
- [ ] 2.28 eV
- [ ] no electron will be ejected

Question 8

1 pts



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What is the threshold frequency for a sheet of aluminum?

- [ ] 7.81 x 10^14 Hz
- [ ] 1.77 x 10^15 Hz
- [ ] 3.26 x 10^15 Hz
- [ ] 9.86 x 10^14 Hz

Question 9

1 pts

An electron is traveling with a speed of 1.52×10^7 m/s. What is the effective wavelength of the electron?

- [ ] 9.87 x 10^-12 m
- [ ] 9.11 x 10^-12 m
- [ ] 6.32 x 10^-11 m

- [ ] 4.79 x 10^-11 m

Question 10

1 pts

When monochromatic light with a frequency f strikes a metal surface with work function Φ, electrons are ejected with a maximum amount of kinetic energy K. If the frequency of the light is doubled, which of the following statements is true?

- [ ] The new maximum kinetic energy will be less than double the previous maximum kinetic energy
- [ ] The maximum kinetic energy will not change
- [ ] The new maximum kinetic energy will be more than double the previous maximum kinetic energy
- [ ] The new maximum kinetic energy will be exactly double the previous maximum kinetic energy

Question 11

1 pts

A slowly moving proton has its velocity doubled. How does this affect its deBroglie wavelength?

- [ ] it is quadrupled
- [ ] it is divided by 4
- [ ] it is divided by 2
- [ ] it is doubled

Question 12

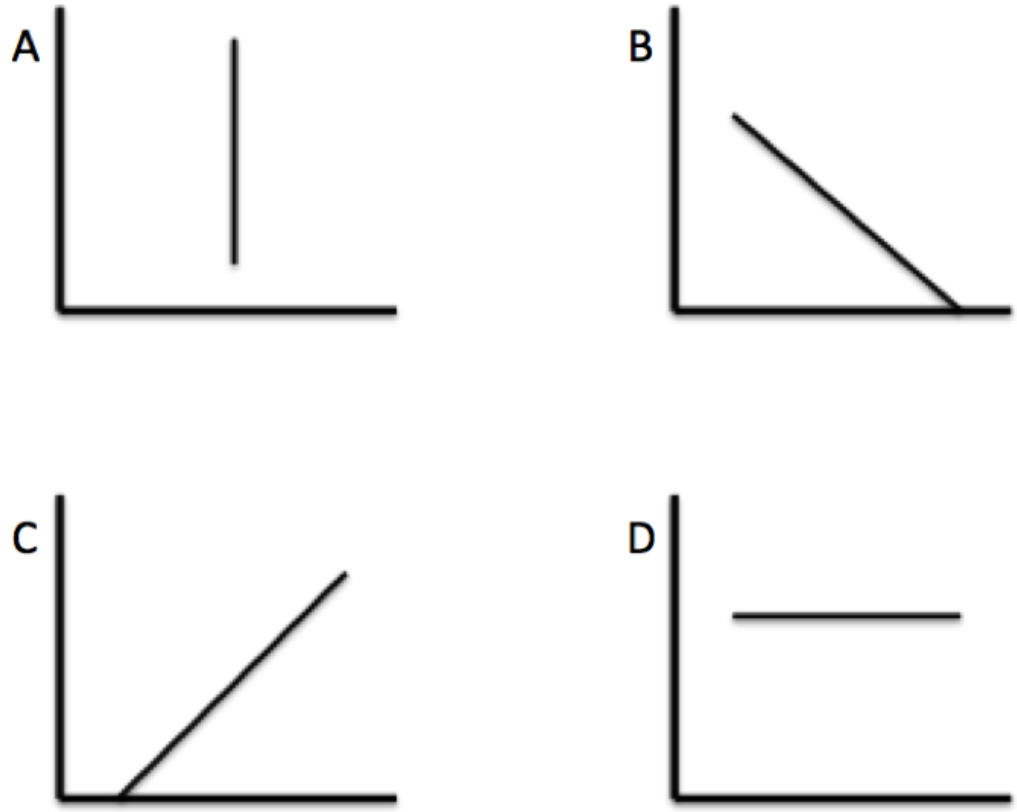
1 pts

A slowly moving proton has its kinetic energy doubled. How does this affect its deBroglie wavelength?

- it is divided by √4
- it is multiplied by √2
- it is multiplied by √4
- it is divided by √2

Question 13

1 pts

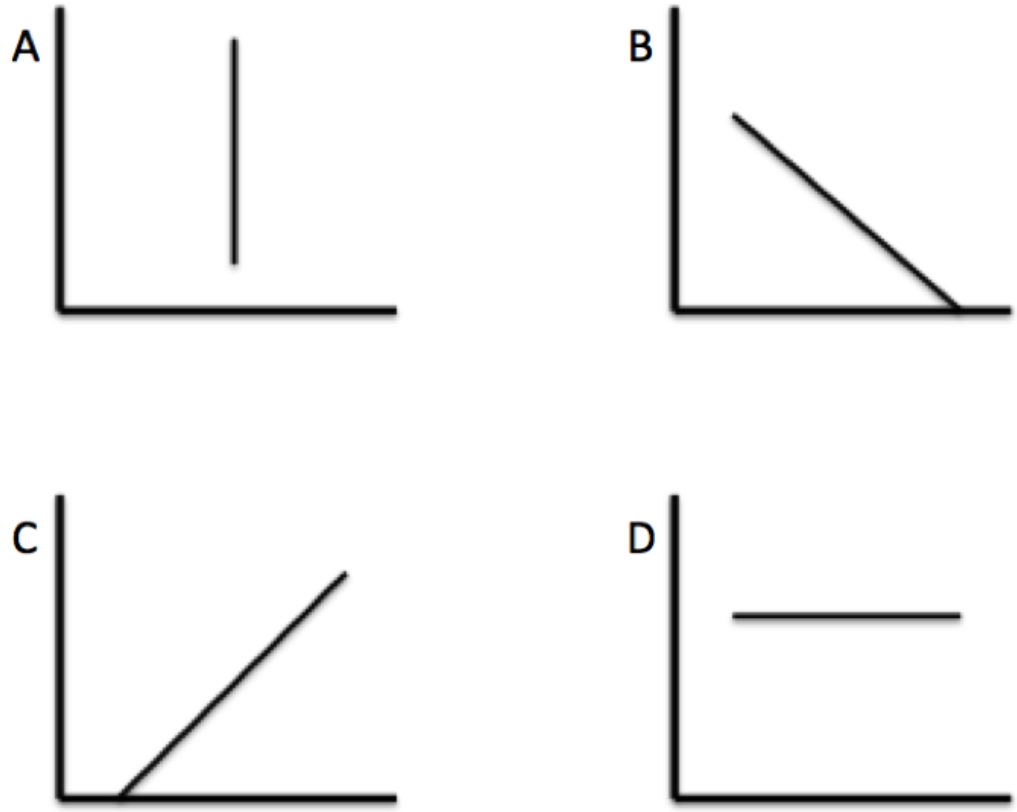


Which graph above represents the relationship between the maximum kinetic energy of a photoelectron and the **intensity** of the incident light?

- [ ] D
- [ ] C
- [ ] A
- [ ] B

Question 14

1 pts



Which graph above represents the relationship between the maximum kinetic energy of a photoelectron and the **frequency** of the incident light?

- B
- D
- A

- [ ] C

Question 15

1 pts

An electromagnetic wave has a wavelength of 625 nm. What is the energy of the wave?

- [ ] 1.99 x 10^-19 J
- [ ] 5.10 x 10^-19 J
- [ ] 5.25 x 10^-19 J
- [ ] 3.18 x 10^-19 J

Question 16

1 pts

An electromagnetic wave has a wavelength of 625 nm. In what region of the electromagnetic spectrum is this wave found?

- [ ] UV
- [ ] visible light
- [ ] radio
- [ ] infrared

Question 17

1 pts

mass of a proton = 1.0073 amu
mass of a neutron = 1.0087 amu
1 amu = 931 MeV

Isotopes of iodine are used in medicine as a diagnostic tool and as treatment in some cases. I-131 (mass of 130.906 amu) can be used in both roles. Find the mass defect of I-131.

- [ ] 1.2205 amu
- [ ] 0.9985 amu
- [ ] 1.0112 amu
- [ ] 1.1595 amu

Question 18

1 pts

mass of a proton = 1.0073 amu
mass of a neutron = 1.0087 amu
1 amu = 931 MeV

What is the total binding energy of I-131?

- [ ] 7.73 x 10^-12 J

- [ ] 2.09 x 10^-11 J
- [ ] 1.73 x 10^-10 J
- [ ] 9.14 x 10^-11 J

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