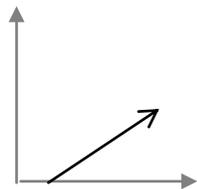
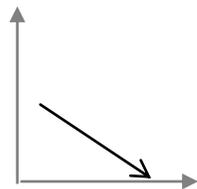


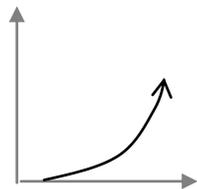
MULTIPLE CHOICE REVIEW: CHAPTERS 27 – 29



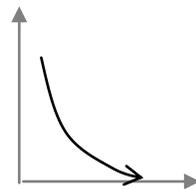
Graph A



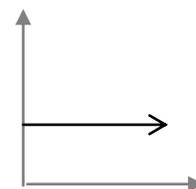
Graph B



Graph C



Graph D



Graph E

The two questions below relate to the five graphs pictured above and the photoelectric effect.

1984 – 42. Which graph best shows the maximum kinetic energy K of the photoelectrons as a function of the frequency of incident light?

- a. Graph A
- b. Graph B
- c. Graph C
- d. Graph D
- e. Graph E

1984 – 43. Which graph best shows the maximum kinetic energy K of the photoelectrons as a function of the intensity of incident light?

- a. Graph A
- b. Graph B
- c. Graph C
- d. Graph D
- e. Graph E

1998 – 34. If the momentum of an electron doubles, its deBroglie wavelength is multiplied by a factor of . . .

- a. $\frac{1}{4}$
- b. $\frac{1}{2}$
- c. 1
- d. 2
- e. 4

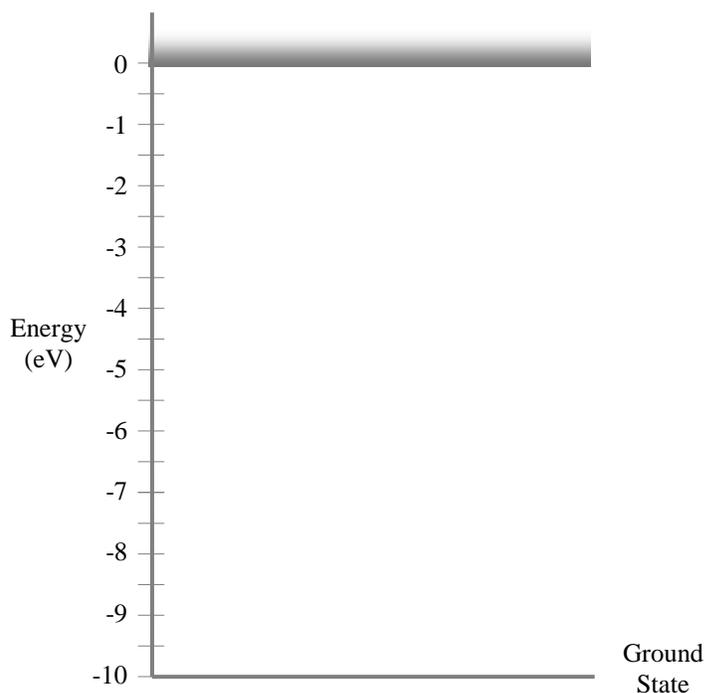
1993 – 36. Cobalt 60 is a radioactive source with a half life of about 5 years. After how many years will the activity of a new sample of Cobalt 60 be decreased to one eighth of its original value?

- a. 2.5 years.
- b. 5 years.
- c. 10 years.
- d. 15 years.
- e. It depends on the original amount of Cobalt 60.

FREE RESPONSE REVIEW: CHAPTERS 27 – 29

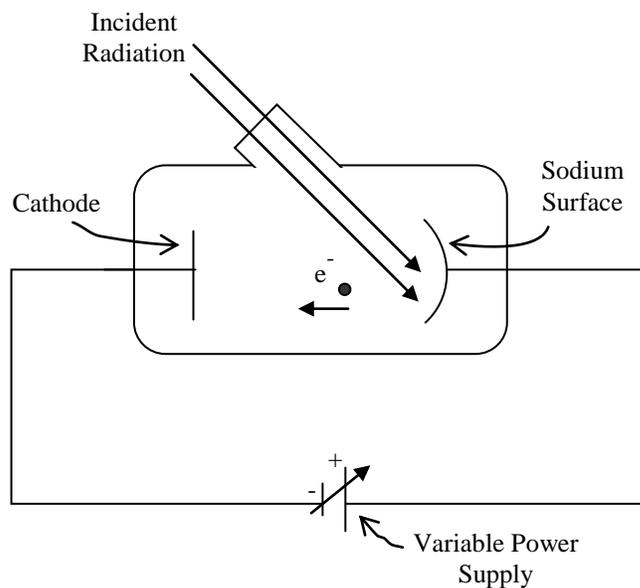
1992 – 4. The ground state energy of a hypothetical atom is at -10.0 eV. When these atoms, in the ground state, are illuminated with light, only the wavelengths of 207 nm and 146 nm are absorbed by the atoms.

- Calculate the energies of the photons of light of the two absorption-spectrum wavelengths.
- Complete the energy-level diagram shown below for these atoms by showing all the excited energy states.



- Show by arrows on the energy-level diagram all of the possible transitions that would produce emission-spectrum lines.
- What would be the wavelength of the emission line corresponding to the transition from the second excited state to the first excited state?
- Would the emission line in part (d) be visible? Briefly, justify your answer.

FREE RESPONSE REVIEW: CHAPTERS 27 – 29 (CONT)



2000 – 5. A sodium photoelectric surface with work function 2.3 eV is illuminated by electromagnetic radiation and emits electrons. The electrons travel toward a negatively charged cathode and complete the circuit shown above. The potential difference supplied by the power supply is increased, and when it reaches 4.5 V, no electrons reach the cathode.

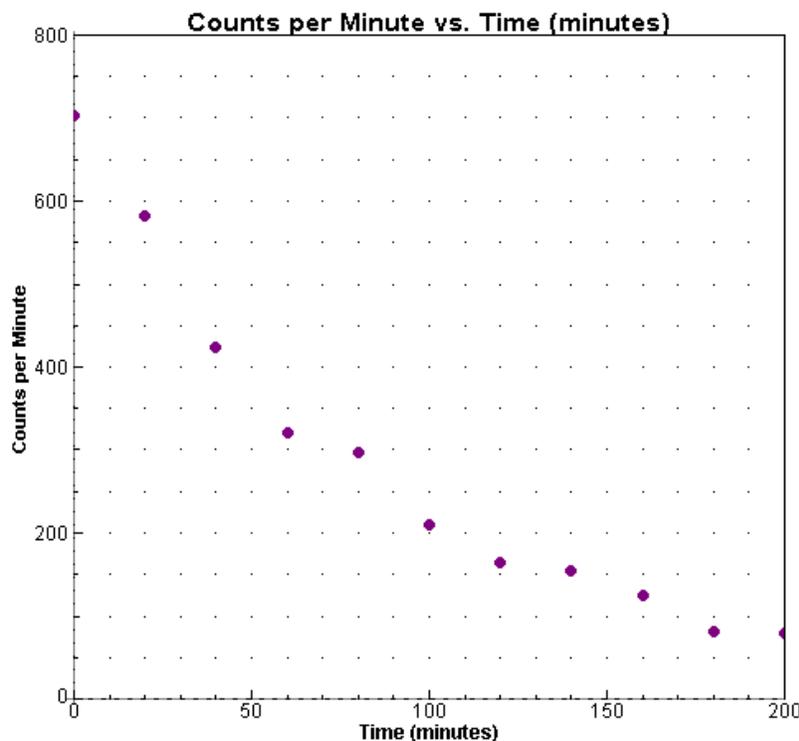
- For the electrons emitted from the sodium surface, calculate the following.
 - The maximum kinetic energy.
 - The speed at this maximum kinetic energy.
- Calculate the wavelength of the radiation that is incident on the sodium surface.
- Calculate the minimum frequency of light that will cause photoemission from this sodium surface.

FREE RESPONSE REVIEW: CHAPTERS 27 – 29 (CONT)

1999 – 4. You use a Geiger counter to measure the decay of a radioactive sample of bismuth 212 over a period of time and obtain the following results.

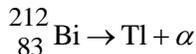
Time (min)	0	20	40	60	80	100	120	140	160	180	200
Counts/minute	702	582	423	320	298	209	164	154	124	81	79

(a) Your results are plotted on the following graph. On the graph, draw an estimate of a best-fit curve that shows the radioactive counts as a function of time.



(b) From the data or from your graph, determine the half-life of this isotope. Explain how you arrived at your answer.

(c) The bismuth isotope decays into thallium by emitting an alpha particle according to the equation below. Determine the atomic number Z and the mass number A of the thallium nucleus produced.



(d) The mass of the alpha particle is 6.64×10^{-27} kg. Its measured kinetic energy is 6.09 MeV and its speed is much less than the speed of light.

i. Determine the momentum of the alpha particle.

ii. Determine the kinetic energy of the recoiling thallium nucleus.

(e) Determine the total energy released during the decay of 1 mole of bismuth 212.