15. Modern Physics

Starter Quiz · 课前小测

AP Physics 2 Name: _____ Score: _____

1. The energy of a single photon is given by:
   - ☐ $E = mc^2$
   - ☐ $E = hf$
   - ☐ $E = \frac{1}{2}mv^2$
   - ☐ $E = IV$
2. In the Bohr model, an electron can have:
   - ☐ any energy at all
   - ☐ only certain fixed energy levels
   - ☐ zero energy always
   - ☐ negative frequency
3. An emission spectrum shows:
   - ☐ dark lines on a rainbow
   - ☐ bright lines on a black background
   - ☐ a smooth rainbow only
   - ☐ nothing
4. As a blackbody gets hotter, its peak wavelength:
   - ☐ gets longer (redder)
   - ☐ gets shorter (bluer)
   - ☐ stays the same
   - ☐ disappears
5. Below the threshold frequency, increasing the brightness of the light:
   - ☐ ejects many electrons
   - ☐ ejects no electrons at all
   - ☐ ejects faster electrons
   - ☐ melts the metal
6. A photon is only absorbed if its energy exactly matches the gap between two levels.

   ☐ True ☐ False

7. For a given element, its absorption lines fall at the same frequencies as its emission lines.

   ☐ True ☐ False
8. A hotter blackbody emits more intensity at every wavelength than a cooler one.

   ☐ True ☐ False
9. Above the threshold, higher-frequency light ejects electrons with more kinetic energy.

   ☐ True ☐ False
10. Nuclear fusion powers the _____ and the stars.

    _____

AP Physics 2

1. $E = hf$

   $E = hf$ — Planck's constant times the frequency.

2. **only certain fixed energy levels**

   Energy levels are quantised — only certain fixed values are allowed.

3. **bright lines on a black background**

   Electrons dropping down emit photons, giving bright lines on black.

4. **gets shorter (bluer)**

   A hotter body peaks at a shorter wavelength — the glow shifts toward blue.

5. **ejects no electrons at all**

   Below threshold, each photon is too weak — brightness cannot free any electrons.

6. **True**

   Only photons matching a level gap can be absorbed or emitted.

7. **True**

   Both come from the same energy-level gaps, so they share the same frequencies.

8. **True**

   The hotter curve is taller at all wavelengths.

9. **True**

   $hf = \phi + \mathrm{KE}_{\max}$: more photon energy leaves more kinetic energy.

10. **Sun**

    The Sun fuses hydrogen into helium, releasing its energy.