1. What does area under a velocity-time graph represent?

   ☐ Displacement

   ☐ Acceleration

   ☐ Mass

2. For fixed momentum change, which reduces average stopping force?

   ☐ Shorter stopping time

   ☐ Ignoring external force

   ☐ Longer stopping time

3. What happens to kinetic energy when speed doubles at fixed mass?

   ☐ It quadruples

   ☐ It doubles

   ☐ It stays constant

4. How is a voltmeter connected to measure voltage across a resistor?

   ☐ In parallel with the resistor

   ☐ Across the ammeter only

   ☐ In series only

5. At fixed above-threshold frequency, increasing intensity mainly increases what?

   ☐ Photon energy

   ☐ Work function

   ☐ The number of emitted electrons per time

6. An ideal transformer has Np=400, Ns=100 and Vp=20 V. Find Vs.

   _____ V

7. Field strength is 18 units at r. Find it at 3r for an inverse-square field.

   _____

8. At fixed volume, pressure is 120 kPa at 300 K. Find pressure at 350 K.

   _____ kPa

   _____ counts/min

10. A source gives flux 18 units. Find flux at three times the distance.

    _____

1. **Displacement**

   Area under a velocity-time graph has units of velocity x time = metres, which is displacement. Acceleration is the GRADIENT of the same graph, and mass does not appear on it at all.

2. **Longer stopping time**

   For a fixed momentum change, average force = momentum change / time, so a longer stopping time divides the same change by a larger number and gives a smaller force. Crumple zones and airbags apply exactly this.

3. **It quadruples**

   Kinetic energy depends on v squared: KE = 1/2 m v^2. Doubling v squares the factor 2, giving four times the energy at the same mass - which is why braking distances grow so quickly with speed.

4. **In parallel with the resistor**

   A voltmeter measures the potential difference between two points, so it connects in parallel across the component. In series it would add its very large resistance to the circuit and the current would collapse.

5. **The number of emitted electrons per time**

   Photon energy depends only on frequency (E = hf), so raising intensity at fixed frequency adds more photons, each unchanged. More photons above threshold liberate more electrons per second; the work function is a property of the surface.

6. **5 V**

   The result is 5 V. Known: Np = 400, Ns = 100, Vp = 20 V, ideal transformer. Use Vs/Vp = Ns/Np. Rearranging: Vs = Vp x Ns/Np = 20 x 100/400 = 5 V. Fewer secondary turns step the voltage down.

7. **2**

   The result is 2 . Known: field 18 units at r; inverse-square field; distance 3r. Use g proportional to 1/r^2. New field = 18/3^2 = 18/9 = 2 units. The force on a fixed mass falls in the same ratio.

8. **140 kPa**

   The result is 140 kPa. Known: p1 = 120 kPa at T1 = 300 K, fixed volume and amount; T2 = 350 K. Use p2/p1 = T2/T1. Rearranging: p2 = p1 x T2/T1 = 120 x 350/300 = 140 kPa. The ratio works only because both temperatures are in kelvin.

9. **20 counts/min**

   The result is 20 counts/min. Known: initial count 160 per minute; three half-lives. Each half-life halves the activity: 160 -> 80 -> 40 -> 20 counts per minute. After three half-lives the count is 160/(2^3) = 20 per minute.

10. **2**

    The result is 2 . Known: flux 18 units at the original distance; distance triples. Use F proportional to 1/d^2. New flux = 18/3^2 = 18/9 = 2 units. This assumes constant luminosity and no extra absorption.