EEE225 Semiconductors Quick Quiz

1) In a semiconductor, $\boldsymbol{np = n_i^2}$ is only true for intrinsic material.

2) At T = 0K, all levels above the Fermi level (E_F) are **empty**.

3) A n-type semiconductor has a net **negative** charge.

4) At *very* high temperatures, a n-type semiconductor *can* become **intrinsic**.

5) If E_g = 8eV, the material is normally an ***insulator***.

6) In a metal-semiconductor junction, if $\Phi_S > \Phi_M$, we get a ***Schottky*** contact.

7) For a p-n junction in equilibrium, the Fermi level, (E_F), is continuous.

8) Schottky diodes generally have a ***higher*** operating speed than p-n junction diodes.

9) **All** metal-semiconductor junctions can rectify.

10) The built-in voltage in a p-n junction opposes further diffusion of majority carriers.

11) At very low temperatures, a n-doped semiconductor can become ***intrinsic***.

12) The expression $P(E) = \{1+exp[(E-E_F)/kT]\}^{-1}$ is called the Fermi-Boltzmann function.

13) For conduction in a semiconductor, you ***must*** always have ***some*** electrons in the conduction band.

14) The Fermi level is close to the *valence band* in a p-doped semiconductor.

15) Learning about semiconductors is **very interesting**.

16) A **group III** impurity can act as an **acceptor** in Silicon.

17) At room temperature in a p-type semiconductor, $\boldsymbol{N_A \approx p}$.

18) The quantised energy spacing for the levels $n = 1,2,3$…in a quantum well varies as $1/\boldsymbol{n^2}$.

19) To obtain an n-type semiconductor at room temperature, the acceptor level must be > 25meV from the conduction band edge.

20) Ionised donor atoms are **positively** charged.

21) Compensation doping occurs when a semiconductor is doped with ***both*** acceptors ***and*** donors.

22) It is easy to use *compensation doping* to create ***intrinsic*** semiconductors.

23) In ideally compensated material, ***both*** N_A and N_D disappear.

24) The statement, *'No current can flow across a p-n junction if no external voltage is applied'*, is **always** true.

25) Light emitting diodes (LEDs) rely on the **stimulated** emission of photons.

26) Electrons and holes can recombine in a **direct band-gap** semiconductor *only* with a change in momentum.

27) The band-gap, $\mathbf{E_g}$, is defined as the separation between the conduction band and the valence band only at $\boldsymbol{p}$ (or $\boldsymbol{k}$) =0.

28) Generally in a semiconductor, electrons and holes have the **same** effective mass, $\boldsymbol{m^*}$.

29) According to **Heisenberg**, we cannot determine the *exact position* of a particle.

30) The **minimum** thickness of the gate oxide in a metal oxide silicon transistor (MOST) is determined by the deposition uniformity.