

M502: THERMAL ENVIRONMENT

STUDENT CALCULATION EXERCISES

SECTION A – HEAT STRESS

DATA:

Dry Bulb Temperature 30°C

Natural Wet Bulb Temperature 20°C

Air Velocity 0.5 ms⁻¹

Globe Temperature 40°C

Mean Radiant Temperature..... 52°C

Intrinsic Clothing Insulation..... 0.5 clo

Work Situation

(approximate metabolic work rate) Moderate standing work inside a building
(192 Wm⁻²)

Personal Data..... Subjects young, fit and acclimatised

Note: *Assume aspirated wet bulb temperature and natural wet bulb temperature to be the same, ie 20°C.*

QUESTIONS:

1. What is the relative humidity and dew point? Use two different methods to determine the dew point.
2. What is the Normal Effective Temperature? What is the Normal Corrected Effective Temperature?
3. What is the P4SR and your interpretation of this value?
4. What is the Wet Bulb Globe Temperature and your interpretation of this value in terms of the ACGIH screening criteria for TLV?
5. What is the heat stress index and the allowable exposure time?

SECTION B – COLD STRESS

DATA:

Atmospheric Temperature -30°C

Wind Velocity..... 4.2 ms⁻¹

Work Situation Appropriately clothed workers for the environment
undertaking moderate work

Weather Conditions..... Sunny sky

QUESTIONS:

1. What is the wind chill index and the affect on exposed flesh?
2. What is the equivalent chilling temperature?
3. What work/warm up schedule would you recommend in this situation for a 4 hour work shift?