1. Explain the similarities and differences **in details** between/among terms:
   Pick 10 out of 13 questions　　　　　　　　　　　　　　　20%
   a. Love wave vs. Rayleigh wave, **b.** body wave vs. Surface wave, **c.** Moho vs. Decollement, **d.** Seismicity vs. Seismic, **e.** Epicenter vs. Focus, **f.** adiabatic expansion in thermal conduction vs. advection in thermal conduction, **g.** Phase velocity vs. Group velocity, **h.** Entropy vs. Enthalpy, **i.** Magnetic permeability vs. Permitivity, **j.** Precession vs. Wobble of the Earth, **k.** Geoid vs. Reference spheroid/ellipsoid surface, **l.** Airy vs. Pratt hypothesis, **m.** earthquake Magnitude vs. Intensity.

2. Seismic waves can be illustrated as "Ray". Basic models involving seismic p- wave velocity (α) change with depth (z) can be classified into three types show below.

   (a)　　　　　　　　　(b)　　　　　　　　　(c)
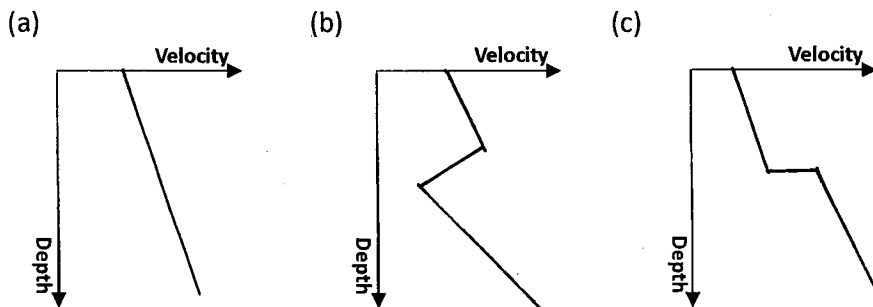
   Q1. Draw "ray-path" and the corresponding "travel-time curve" for each model.
   　　　　　　　　　　　　　　　　(total of 6 figures)　10%

   Q2. Draw the corresponding figures relate to "apparent slowness-distance curve" and "apparent slowness-intercept time curve".　　**(total of 6 figures)**　10%

3. Assuming spherically symmetric Earth with major discontinuities, Please draw the schematic diagram to show and explain each **individual depth phases** and the corresponding **ray paths**.　　　　　　　　　　　　　10%
   a. Pn vs. Pg,　**b.** pS, vs. PS,　**c.** PcP,　**d.** SKS,　**e.** PKiKP vs. PKIKP

4. Describe the data reduction procedure and the differences involving "free-air correction" and "Bouguer correction" in processing of observed gravity data?
   　　　　　　　　　　　　　　　　　　　　　　　　　10%

注意：背面有試題

5. Describe **at least three models** involving with <u>Taiwan Tectonic Models</u> that you know so far.   10%

   What are the **research activities** and/or **known evidences** (but possibly can be revised or modified later) that being investigated so far from **any of the research areas** that you know in Taiwan.   You **must** "**include**" seismic studies and describe **at least other three (to five at most) areas of studies!!**   10%

6. If we consider a small volume of height δz and cross-sectional area a (Figure show below). Any change in temperature δT of this small volume in time δt, the heat per unit time entering the volume across its face at z is aQ(z), whereas leaving the element across its face at $z+\delta z$ is $aQ(z+\delta z)$. **Please try to answer at least 4 out of 6 questions first. If you preferred to answer "all questions", you will gain additional 5 point on each question. :**

   (a) Expanding Q(z z+δz) in a Taylor series,

   (b) Ignoring high order terms, write down the **net gain** of heat per unit time.
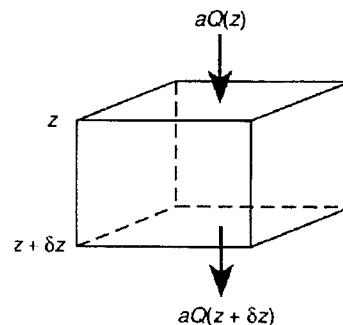
   (c) Suppose that the main **radioactive heat** generate in this volume element at a rate A per unit volume per unit time. Write down the total amount of heat generated per unit time.

   (d) The material has density ρ and specific heat Cp, and undergoes a temperature increase δT in δt, write down **the term that the rate at which heat is gained**.

   (e) Derive the **1D heat conduction equation** in terms of the rate at which heat is gained by the volume element and under the limiting case when δz, $\delta t \rightarrow 0$.

   (f) If we consider 1D column with no erosion or deposition and a constant heat flow. The column **reach thermal equilibrium** where the temperature at any point is steady ($\delta T/\delta t = 0$). Under two boundary conditions: a). T=0 at z=0, and b). heat flow Q=-Qd at z=d. Please **derive and draw the equilibrium geotherm curve(s)** for a model rock column with conductivity, radioactive heat generation and basal heat flow.   20%

A volume element of height δz and cross-sectional area a. Heat is conducted into and out of the element across the shaded faces only. We assume that there is no heat transfer across the other four faces.

注意：背面有試題