**Mathematics Practice Questions**

**M1.**          (a)     In one country where the percentage of fat (in the diet) is 35%,  
the death rate (from breast cancer) is 20 per 100 000;

*Must have reference to country*

*Accept … 1 per 5 000 / 0.02%*

**1**

(b)     1. No. of deaths from breast cancer divided by total population × 100 000;

2. No. of deaths from breast cancer divided by all deaths × 100 000;

3. Sample and count deaths from breast cancer in 100 000 people;

*If sample not 100 000 then must scale appropriately*

**1 max**

(c)     1.      Positive correlation;

2.      But correlation does not show causation / some other (named) factor may be involved;

3.      Evidence against positive correlation e.g. different death rates at same %  
fat / similar death rates at different % fat / some countries with higher  
death rate have lower fat intake;

*1. Accept description of positive correlation / directly proportional.*

*Accept positive relationship.*

*2. Do not accept casual in place of causal.*

*3. Answer must be consistent with data.*

**3**

**[5]**

**M2.**          (a)     (i)      Increase to 30 °C/31 °C and then decreases / optimum or max  
rate at 30 °C/31 °C;

*Accept: peak at 30 °C/31 °C*

**1**

(ii)     1. Enzyme denatured / hydrogen bonds/bonds holding tertiary  
    structure broken / tertiary structure changed;

2. Change in shape of active site (of enzymes);

3. Substrate / protein no longer fits / binds (into active site) / few or no ES  
    complexes;

4. More enzyme (molecules) denatured as temperature increased;

*1. Reject: Peptide bonds broken*

*Denatures active site = 2 marks for mp 1 and 2*

*2. Q Only allow second point if active site is used correctly*

*Accept: active site no longer complementary*

*3. Accept: Substrate cannot bind to enzyme*

**3 max**

(b)     (i)      Use buffer / test pH (at end/ at intervals);

*Accept a method of measuring pH.*

*Reject litmus.*

**1**

(ii)     (30 °C/31 °C) Maximum rate / optimum temperature;

*Accept other valid answers e.g. temp below  
30 °C as enzyme not denatured.*

**1**

(iii)     Works best at pH 6 / at higher pH activity decreases;

*Accept converse*

*Insufficient: pH 6 had largest clear area*

**1**

**[7]**

**M3.**          (a)     Volume (of air in lungs) decreases;

*Accept: Results decrease*

**1**

(b)     Correct answer 1.4;;

Incorrect answer showing (vol. air breathed out =) 6.5 – 2.3 / 4.2 (dm3);

**2**

(c)     Reduced flow rates / less air breathed out / more air left in lungs (after  
breathing out);

*Insufficient: More air in lungs / high volume of air in lungs*

**1**

(d)     1. Alveoli break down / collapse / rupture / fewer alveoli / larger alveoli or  
    alveolar wall/epithelium walls thicken;

2. Reduced surface area / increased diffusion pathway;

3. (So) less diffusion;

4. Less elastin / elastic (tissue) / not recoiling / loss of elasticity / elastin permanently stretched;

5. Reduced flow rate / less air expelled;

6. So small / reduced diffusion or concentration gradient;

*1. Neutral: Damage. Accept alveoli burst*

*Less surface area for diffusion = 2 marks (mark points 2 and 3)*

*3. Accept diffusion less efficient. Reject diffusion of air*

*4. Elastic tissue must be in context of lungs.*

*6. Accept: Not maintaining a steep diffusion/concentration gradient.*

**4 max**

**[8]**

**M4.**          (a)     (i)      1.08;

*Must be to 3 significant figures, as in the table*

**1**

(ii)     Allows comparison/shows proportional change;

*Neutral: sizes/amounts*

         Idea that discs had different starting masses/weights;

*Neutral: different masses*

**2**

(iii)     (Allows)

*Accept: outliers instead of anomalies*

Anomalies to be identified/effect of anomalies to be reduced/  
effect of variation in data to be minimised;

*Reject: idea of not recording anomalies/preventing anomalies from occurring*

         A mean to be calculated;

*Neutral: average*

**2**

(b)     (i)      Plot (sodium chloride) concentration against ratio/draw  
line of best fit;

*Reject: if wrong axes or type of graph*

Find (sodium chloride concentration from the graph) where  
the ratio is 1/there is no change in mass;

**2**

(ii)     Line/curve of best fit is more reliable/precise;

*Neutral: graph*

         Intercept/point where line crosses axis is more reliable/precise;

*Reject: references to ‘more accurate’*

***OR***

         Can plot SD values/error bars;

(To show) variability about the mean/how spread  
out the results are;

**2**

**[9]**