



## Topic 7 – data-based questions

### Page 344–345

- a) after spinning, the solid mass which is at the bottom is referred to as a pellet and the liquid and the smaller molecules/particles that remain suspended in the liquid above the pellet is referred to as the supernatant;
- b) the viruses, being much lighter would remain in the supernatant; in order to transform the cells, the genetic material would need to be found in the cells; since the cells are heavier, the material that transformed the cells would be in the pellet;
- c) 80% of the  $^{35}\text{S}$  remains in the pellet;
- d)  $^{32}\text{P}$  is found in DNA, but not proteins; because the cells / pellet contained the radioactive  $^{32}\text{P}$  the DNA must have been involved in the transformation of the cells; because the cells / pellet did not contain radioactive  $^{35}\text{S}$ , the sulphur is not responsible for transforming the cells;

### Page 349

1. (i) 250 bp / the smallest fragment / the fragment furthest from the origin;  
 (ii) 500 bp/ the second smallest fragment;  
 (iii) 750 bp;
2. 250 bp;
3. there would only be a fragment that was 250 bp long and it would be brighter;

### Page 353

- a) starting with the fragment at the bottom: 123, 246, 369, 492, 615, 738, 861
- b) assuming the top of the image is the origin

Distance moved[mm]	Fragment size [bp]
0.35	861
0.79	738
1.28	615
1.82	492
2.50	369
3.25	246
4.20	123

8)

Individual	Distance moved [mm]	Estimated fragment size [bp]
#1	2.4	420
	2.7	370
#2	1.7	550
	3.5	220
#3	1.4	610
	2.8	340
#4	1.1	680
	1.8	550
#5	1.2	660
	3.1	290
#6	1.6	580
	1.8	540



e)

Estimated length [bp]	Estimated number of repeats
420	26
370	23
550	34
220	14
610	38
340	21
680	43
550	34
660	41
290	18
580	36
540	34

f) run the gel for longer;

**Page 356**

- a) approximately 40%;
- b) identical twins have the same combination of paternal and maternal chromosomes; their genotypes are the same for all genes; having a higher probability of both having the disease than siblings/ fraternal twins suggests genetic component to the condition;
- c) height has the highest contribution coming from genetics, but not entirely; there is still an environmental component; rheumatoid arthritis has lowest genetic contribution, but still some component; diabetes has significant increase in probability with genetics, but still relatively low overall probability; alcoholism has a genetic component;

**Page 358**

1. green mixes with red to produce yellow; if both are methylated in the same places then green will always mix with red to produce yellow;
2. all show differences between the two twins with chromosome 1 and 17 showing some similarities;
3. chromosome 3 has the least yellow;
4. differences in methylation represent differences in regulation of gene expression; twins exposed to different conditions that effect gene expression resulting in methylation at different locations;
5. as they grow from 3 years old to 50 years old, they will become different from one another in those areas where gene expression is influenced by environmental factors;

**Page 369**

the alpha chain: is missing a (his) at residue #2 / has had a deletion at residue #2; the alpha chain has an (ala) where the beta chain has a (glu); (glu) is more polar than (ala) and will affect protein folding; the beta chain has more residues; the alpha chain and beta chain both begin with a non-polar aa (val); the alpha chain has more deletions;

**Page 371**

- a) epsilon and zeta globin;
- b) gamma is expressed in the first 10 weeks while beta is not; while gamma declines, beta increases: gamma is not expressed at six months while beta is significant fraction of hemoglobin at six months; both are expressed in approximately equal amounts at 24 days;
- c) at 10 weeks, hemoglobin is composed of equal amounts of alpha and gamma globin; at 6 months, hemoglobin is primarily composed of alpha globin and beta globin with smaller amounts of delta globin;
- d) maternal blood;



- e) fetal blood and maternal blood will differ in affinity for oxygen; (difference in hemoglobin structure gives) fetal blood greater affinity so oxygen will move from mother to fetus; change (with development) necessary so fetus can prepare for independent gas exchange/transition from placental to pulmonary gas exchange.