<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 (a)</td><td>
<table>
<tr><th>genotype</th><th>description of genotype</th><th>phenotype</th></tr>
<tr><td>(LL)</td><td>(homozygous dominant)</td><td>long winged</td></tr>
<tr><td>(Ll)</td><td>(heterozygous)</td><td>long winged;</td></tr>
<tr><td>ll;</td><td><u>homozygous recessive</u>;</td><td>(short winged)</td></tr>
</table>
</td><td>long winged x 2 = 1 mark</td><td>3</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>number</th><th>tick</th></tr>
<tr><td>204</td><td></td></tr>
<tr><td>408</td><td>✓</td></tr>
<tr><td>612</td><td></td></tr>
<tr><td>816</td><td></td></tr>
</table>
</td><td>more than one tick = 0</td><td>1</td></tr>
</table>

Question number	Answer	Notes	Marks
1 (c)	fruit → yeast → flies; arrows used and correct;	yeast in middle = 1	2
(d) (i)	type of fruit / eq; mass/amount of fruit / eq; gender / species / type / size of fly; temperature; light; humidity;	ignore number of flies / time	max 2
(ii)	(no) not repeated / only done once / use more flies / eq; (yes) used lots of flies;		1
		Total	**9**

Question number	Answer	Notes	Marks
2 (a)	1 ZZ ZW; (gender must be clear) 2 Z Z (and) W; 3 ZZ ZW; 4 male female;	X and Y alone = 0 allow 2 and 3 in Punnett square and 1 and 4 if labelled	4
(b) (i)	protein; amino acids / muscles / bone / enzymes / cells / tissues / eq;	ignore calcium ignore vitamins	2
(ii)	fats / lipids / cholesterol / (named) carbohydrate; energy / cell membrane;		Max 1
(iii)	respiration; (less) dehydration / eq; protection / less chance of breaking / prevents cracking / eq; cheese / fish / eggs /milk / low-fat spreads / yoghurt / liver / carrots / sweet potatoes / eq; immunity / vision (in dim light) / healthy skin / bone <u>metabolism</u> / gene transcription / embryo development / eq;		2
(c)	meiosis; gametes / sex cells / sperm <u>and</u> egg; haploid / n / half / 23; fertilization / fuse / combine / join / eq; diploid / 2n / full set / 46;		Max 3
		Total	12

Question number	Answer	Notes	Marks
3 (a) (i)	parents: Aa Aa; gametes: A a A a; offspring: AA Aa Aa aa; phenotypes: short short short average;	allow parent, gamete and offspring marks in Punnett square if parent genotypes wrong allow ecf to max of 3 for gametes, offspring and phenotypes allow if other symbols used allow other terms for short and average eg achondroplasia and tall only give phenotype mark if it is clear that candidate knows there are three short and one average a statement that the phenotypes are short and average = 0	4
(b)	¼ / 25% / 0.25 / 1 in 4 / eq;	ecf	1

Question number	Answer	Notes	Marks
3 (c) (i)	always / in heterozygote / in both heterozygote and homozygote / eq; expressed / seen / shown / determines characteristic / develops the trait / (in phenotype) / eq;	ignore stronger / overpowers / masks	Max 2
(ii)	1. t se with achondroplasia less likely to have children / reproduce / eq; 2. a ele is rare / eq; 3. lective advantage for aa / eq;	allow converse for all points allow health implications for achondroplasia	Max 2

Total 9 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>4 (a)</td><td><table><tr><th>Order</th><th>Name of stage</th></tr><tr><td>1</td><td>gamet s;</td></tr><tr><td>2</td><td>z gote</td></tr><tr><td>3</td><td>embry</td></tr><tr><td>4</td><td>etus;;</td></tr><tr><td>5</td><td>baby</td></tr></table></td><td>1 mark for gametes
1 mark for baby
2 marks for zef

1 mark for zfe or ezf or fez</td><td>4</td></tr>
<tr><td>(b) (i)</td><td>connection between <u>atria</u> / eq;
connection between arteries / pulmonary artery and aorta;</td><td></td><td>2</td></tr>
<tr><td>(c) (i)

(ii)</td><td>XY;

46 or 23 <u>pairs</u></td><td></td><td>1

1</td></tr>
</table>

TOTAL 8 MARKS