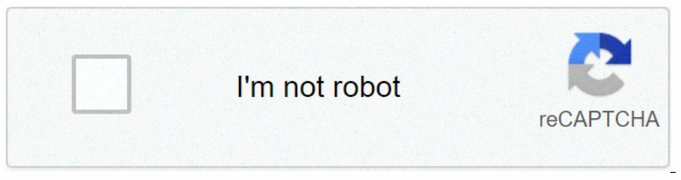

Continue

Genetics practice problems

The answer keys about these problems run on a somewhat complicated scale from the very simple to the problems of each week. The intention is to use you to solve the problem. Questions on homework and exams will be on the complex end of the scale. For samples of homework/exam problems, look behind the course notes package and here. Lectures 35 1. A colony of black cats produces a total of 400 kittens a year. One of the kittens gets out for a major mutation, giving the kitten the baby blue polka dots. Is there a possibility that wild type allele will be lost due to genetic drift in the next generation? 2. There are 400 members in a separate colony of the same species of cats, of which 396 show polka-dot phenotypes. This colony merges with a large colony with 546 polka dotted out of 600 members. What will be the frequency of black cats in the next generation? 3. In another colony of these monstrous cats, the frequency of plain black cats is 0.25. (i) If the colony is infected with a deadly virus that kills only polka-dotted individuals, what would be the frequency of black eyl in the next generation? (ii) If the virus kills only plain black cats, what will be the frequency of black cats in the next generation? (Let's say the virus has disappeared by then.) 4. A population since 1998 is completely homojigus for Aile D. However, D can mutate D at the rate of 0.00012 per generation, while D mutes D at the rate of 0.00004 per generation. The population is otherwise in Hardy-Weinberg situations. (i) Given the infinite time, which Ellen do you think will eventually prevail in the population? why? (ii) the change in frequency of D per generation? How about changes in frequency of D? (Remember that for each part, you need to take into account both further mutations and back mutations.) (iii) What will be the two alleal frequencies when they reach equilibrium (increase in frequency of D by further mutation matching the deficiency due to back mutation)? 5. You have to think about... (i) 250 members in the population of 1000 persons are identical ineffective BB. What is the estimated number of BB and BB individuals if this population shows hardy-weinberg frequencies? [That's the easy part.] (ii) and now the actual question: The actual number of BB persons was found to be 220 and the number of BB persons was 580. If you wanted to do a chi-square test to see if these numbers correspond to hardy-weinberg predictions, what value would you use for DF (#of degrees of freedom)? why? Lectures 36 and 37 6. One of the problems using DNA tests to screen for carriers of cystic fibrosis is that there is only ~70% success rate in detecting carriers in the test (because there are many different mutant alliles in the population). For the following questions, assume that the frequency of carriers = 0.05. (i) If all Matrimony Partners are checking for carrier status, what excerpts of heterozygote/heterozygote. (that is, heterozygote x hettrozygott is not recognized as pairs). (ii) If only one member is tested in a couple, and heterozigogote is found, what is the probability that both the members of the couple are heterozygotts? (iii) If one member is found to be heterotropitic and another member is also tested and found that the disease is not alliles, what is the probability that both the members of the couple are heteroggotes? 7. A young boy has acute familial hypercholeteriomia because both copies of the LDL receptor gene contain promoter mutations that block their transcription. Family physicians are well aware of the use of bile acid binding resins in the treatment of hypercholeteriomia, but he tells the family that in this case the treatment will be ineffective. What was his (correct) argument? 8. As a last resort in treating a major disease, some clinical researchers decided to use an antisense formulation to block disease gene function. Mutant Eli (marks the asterisk mutation) and two possible antisense constructions (Build 1 and Build 2) are shown. Which of these two constructions is a better chance to succeed as an antisense creation, and why? Quiz section lecture 30 #3 for 1, #8 and #13. In Drosophila, both torso and FS are maternal influence genes that produce homogeneous females embryos with phenotypes that lack tail structures. If you were given the strain of Drosophila that showed this phenotype (i.e., women produced tailless offspring), how would you determine which gene was mutated? 2. What changes in the expression pattern of Crepel and Norps would you expect for a mutant that has high levels of both bibide and nanotechnology? (Let's say that the increased transcription of the hunchback corresponds to the increasing blockage of the cochback translation.) 3. The second thoracic segment in Drosophila is believed to produce wings, while the third thoracic segment should produce halter (flight balancer). A new homotic mutation mutation causes the mutation 1 wings to develop on the second and third thoracic segments (no rein anywhere), while a second mutation causes mut2 to develop on both segments (no wings anywhere). Depending on what you know about setting segment identities, tell us if you expect each mutant phenotype to be effective or ineffective, and why. Lectures 31 4. For each of the following symptoms, state that phenotype-genetic variation or environmental factors are more important in determining: characteristic herability (i) by Thomson's gazelle 0.6 (ii) sunflower in seed size 0.65 (iii) turtles in penis (female vs. male) 0.1 (iv) egghel thickness in snapping 0.4 5. In the city of metropolis, all schools are equally good, are objectively encouraged in mental functions, and all Environmental factors relevant to IQ tests are consistently good; That means there is no variation in the environment within the metropolis about school education. In Gotham City (in the same country), all schools are equally poor, learning is never encouraged, and all environmental factors relevant to taking IQ tests are consistently unfavourable; That means there is no variation in the environment with regard to education within Gotham City. (i) what is the percentage of intelligence within the metropolis and within the city of Gotham? To explain. (ii) What could be the reason for differences in IQ score while comparing between Mahanagar and Gotham city? Lectures 32 Questions 6-9 are reproduced from lecture notes (before page p.133). 6. Assume that the height in a plant is controlled by two gene pairs and each additive elial contributes 5 cm to the base height of 20 cm (i.e., aabb = 20 cm). (i) What is the height of AAB plant? (ii) Predict phenotypeic ratio of F1 and F2 plants in a cross between Aabb and AABB. (iii) List all genotypes that give birth to plants that are 25 and 35 cm in height. 7. In a cross where three gene pairs determine the weight in squash, in which proportion of individuals of Cross ABCCC x AABCC will only have 2 additive allels? Do genotype(s) fall into this category? 8. An inbred tension of plants has an average height of 24 cm. A second strain of the same species from a different country also has an average height of 24 cm. F1 plants are also 24 cm higher than a cross between these two strains. However, the F2 generation shows a wide range of heights; The majority are like P1 and F1 plants, but about 4 of the 1000 are only 12 cm higher, and 4 36 cm more than 1000. (i) What mode of inheritance is taking place here? 2 How many gene pairs are included? (iii) To what extent each gene contributes to the height of the plant? (iv) Indicate a possible set of genotypes of P1 and F1 plants that can explain their heights. (v) Indicate a possible set of genotypes in the account of 18 cm or 33 cm high F2 plants. 9. Plants can be 10, 20, 30, 40, 50, 60 or 70 cm high where the plant height is under polygenic control. A 10 cm true breeding plant crosses a 50 cm true breeder. How many gene pairs are involved? Can F1 and F2 results be predicted? Lectures 33 10. In a certain population of 20 million people, an autosomal ineffective characteristic in 500 individuals, dissatisfied intolerance is found. Assuming that this number reflects the Hardy-Weinberg frequencies, how many individuals in the population are expected to be carriers of the specialty? 11. Island iguanas come in two varieties, beach love (major phenotype) and bridge love (ineffective phenotype). The frequency of bridge lover iguana on an island is 0.04. On a neighboring island that has a similarly sized population of iguanas, the bridge-loving frequency of iguanas 0.16. One day some bridge lovers iguanas build a bridge between two islands, so now iguanas can move freely between the islands. (i) Suppose the iguana on each island is exclusively with iguana from another island, what will be the frequency of the bridge-loving iguana in the next generation? How about the generation that followed? (ii) Suppose, instead, the beach-loving iguana on one island was only with beach lover Iguana on another island, and the bridge-loving iguana on an island only got matched with the bridge lover Iguana on another island, what would be the frequency of beach lover and bridge lover iguana in the next generation? 12. What is the relationship between genotype frequency and allile frequency in women versus men for the ineffective characteristic associated with an X? 13. Pattern baldness is an autosomal feature in humans that reflects the inheritance affected by sex - it is prominent in men (BBBB and BBBB men become bald) but ineffective in women (only BBBB women become bald). In a certain population that exhibits hardy-weinberg frequencies, 9% of women become bald. (i) What percentage of men goes bald? (ii) What would be the frequency of Ail BB among men in the next generation? Questions from old 1-1998 diagram is a series of crosses that will allow you to screen for maternal effects mutations. For each of the following pairs of population 2-1998, the state which will show you high heritability (in the broad sense) for the characteristic T, and why: (i) a population that is mostly identical to the gene that controls characteristic T, or one that is mostly odd (ii) in a population that is mostly in similar environments in relation to factors affecting characteristic T, or which is in more heterogeneous environments. 3-1998 The frequency of an ineffective elyse in the population is 0.2. Assuming that major and ineffective Allils are in hardy-weinberg frequencies, the following predict the possibilities of each of the mating: (i) Homojiguus major x samosadar major (ii) odd x homogenous ineffective (iii) odd x odd 4-1998 [Warning: Warning requires actual alzara [horrors!] You choose to examine the aesthetic appeal of common Seattle slug. The aesthetic appeal in the slug is determined by an autosomal locus slim, on which there are three alles. Allils are Icky (Si), Yucky (Sy), and Gross (SG). Icky is dominant on both yucky and gross. Yucky is dominant at Gross. After a long walk through the rain, you see that the phenotypes of the slug are in the following ratio: 50% are icky, 30% are yuki, and 20% are gross. (Don't worry about statistical error in the measurement of these numbers.) Assuming alles are in hardy-weinberg ratios, what are allel frequency P(SI), P(SI), and P (SG)? Which slugs would you move on instead, and why? #2, #4 and #6 for quiz Lectures 27, 28 1. What phenotype would you predict would result from each of the following mutations in E. coli? In each case let's say the cell is otherwise wild type. (a) Lac - (Promoters removed) (b) Lakhosi (c) Lacsi (c) Lacs - (Lakha removed) (d) Lacy - (Missens mutation) (e) Lacy - (Stop coding near the beginning of genes) (f) Cap - (Cap gene delete) (g) Eno - (eno - phosphoral is required for synthesis of pyruvate) 2. For each partly biloved stress shown below, indicate whether beta-galactocytes activity will be persuasion (normal induction), less constituion (i.e., less in the absence of appearance or inductive), or constituional high (high in the absence of appearance or inductive). Give a brief explanation for each answer. Suppose glucose is never present. (i) i-p+oc z+i+p+o+z-(ii) i+p+o+o+(iii) i-p-oc z+ (iv) p-o+ z+ i-p+1-p+oc z-p+oc z+oc z+oc z+oc-mute operator to prevent the binding of oppressive; Is the mutation resulting in a super-suppressor that cannot be uprooted from the operator; P mutations prevent transcription initiation from the promoter; OC mutations prevent the operator's binding of oppressive, and Z-mutations cause the production of non-functional beta-gal. 3. You have heard in the lecture that galactose can neutralize gal80 proteins, allowing transcription of galactose-orbital genes. In fact, Gal80 does not directly respond to galactose; Rather, in response to galactose, Gal3 binds proteins and neutralizes Gal80 proteins. State do you expect to give a major or ineffective phenotype to each of the following GAL3 mutations: (a) gal3c: Binds and disables Gal80 whether galectose exists or absent (b) gal3-: unable to binding to Gal80 protein 4. The diagram below represents an unspeakable operand in a certain bacterium; A, B and C represent three structural genes. The control elements contain promoters, operators, etc. Control element gene A gene B gene C ----- ==---------- -----=---------- (a) A mutation in Gene B results in a deficiency of functional proteins B and C, but protein A is functional. Explain this phenotype. (b) Regulatory mutations were found in a separate gene reggae. The reg-1 mutation results in a high expression of operan ABC; The Reg-2 mutation results in a constituion low expression of ABC. Partly the use of diploid bacteria suggests that reg-1 phenotype is dominant, while reg-2 phenotype is ineffective. Offer a mechanism for regulating the oper ABC. Lectures 29 5. A certain mutation in toad xenopus is fatal. The examination of fetal development shows that early development is indistinguishable from normal and wild types, but the development stalls after the first few cell divisions. Based on what you know about the development in Drosophila, a suggestion For the delayed effect of xenopus mutation. 6. Predict the phenotype of the following homojigus faucet mutation in Drosophila. (a) Nano - (b) Hunchback - (Here suppose it is a purely zygotic gene) Also try: 1998 Problem Set 5, Q. 6 (Behind lecture notes) (Some of these are again from 1998. There are only two lectures scheduled for 9 weeks, so the lecture will be included in questions 27 questions week 9.) Quiz section #3, #5, and #12 for Lecture 24 1. Two true breeding, blind strains of crickets were crossing each other. F1 crickets all showed normal vision. When these F1 crickets crossed each other, the resulting F2 progeny included 178 crickets with normal vision and 142 blind crickets. (i) Are the strains of two original parents mutated in the same gene? If not, what is the mm number of genes involved? (ii) Explain the results (why F1 crickets can see, and why this ratio of F2 phenotype was achieved). What progeny ratio would you expect if F1 crickets completely surpassed homogenous ineffective cricket? (iii) Which part of F2 would you expect true breeding? 2. In a certain breed of dogs, B and B determine the color of black (dominant) and brown (ineffective) coats respectively. Ineffective elil e of a different (independently categorized) gene blocks the expression of both B and B allels, giving a yellow coat. (The major E Eli quote does not affect color.) Determine the parent's genotype (give cause) for each of these crosses: (i) Brown dogs gave x yellow dogs - 1/2 yellow pups 1/4 black pups 1/4 brown pups (ii) brown dogs gave x black dogs - 3/8 black pups 3/8 brown pups 1/4 yellow pups 3. A new species of great Northwestern pygmy rats was discovered in some caves near Ellensburg. Analysis of blood samples showed that like humans, these Ellensburg mice came in A, B, AB or O blood types; Like humans, blood type is determined by the addition of a type or B-type sugar to a protein on the surface of blood cells. When scientists crossed a true breeding B bloodtype rat with a true breeding o rat, however, they were surprised to learn that the offspring all had AB blood types. F2 progeny received by crossing these F1 AB mice to a second had the following blood groups: 3/16 there were a 3/16 b 3/8 the AB 1/4 were o explain the result, using Punnett squares to describe your answer. Tip: Are the results similar to a monohybrid ratio or a diebrid ratio? Lectures 25 4. As you have heard before, a common ADE gene in yeast cells (i.e., ade + cells) can grow in the absence of adenine in the medium, and produce white colonies on agar plates. Cells that are ade-require adenine in the medium, and produce red colonies on plates. A yeast strain that a frameshift in ADE gene Given (gene non-functional rendering), identify the identity of revertants for a selection and outline of a screen There is a functional ADE gene. 5. A laboratory in Seattle is interested in understanding the genetics of flower petal evolution in petunias. After mutationsis on the plant and screening of mutant products, they identify three homogeneous mutant strains that fail to make all petals; They call these mutant strains p1 through P3. Meanwhile, they hear from their friends at Sedro Woolley, who had similar screens and identified four ineffective mutant allels r1 through R4 that also failed to make flower petals. laboratories exchange strains and cross between different strains; The ability of progeny to make petals (+) or inability (-) is indicated: p1 p2 p3 r1 r2 r3 r4 p1 -+r1 -+-r2 -+r3 - + r3 - + r4 - R4 - How many genes are represented in this collection of mutant stress? Which mutants represent alliles of the same gene? Why is half the table left empty up? Lectures 26 6. The following is the pathway for the synthesis of E, an essential metabolite of yeast: Which compound or compound (between A-E) will allow the development of yeast deficiency -- (i) Enzyme E3? (ii) Enzyme E4? (iii) Enzymes E2 and E3? You think which compound will accumulate in each of the above mutants? 7. The following branch represents the synthesis of passages E and F, two essential amino acids in a certain mold. (i) Name two compounds (between A-F) which will allow the development of mutants lacking enzyme E3. (ii) Name of a complex that will allow the development of mutants with enzyme E1 deficiency. 8. The purple flower color in a plant species requires the conversion of a white precursor to the red pigment by enzyme E1 and for the blue pigment by enzyme E2. The combination of two pigments gives the purple color, as indicated: (i) What would be the phenotype of a plant homozygus for a zero allele of genes for E1? (ii) What would be the phenotype of a plant homojigus for a zero oil of genes for E2? (iii) What would F1 phenotype(s) be if (i) crossed the plant (ii) in F1 phenotype(s)? (iv) What would be the F2 phenoptype and ratio if F1 plants cross each other? 9. Yeasts that were able to synthesize amino acid histidine were mutanized and incapable mutants in histidine biosynthesis were isolated. [Note: The original, normal stress that may increase in the absence of added histidine, is called prototrophic for histidine, while mutants are oxotroph. The mutation fell into four complementary groups, the M1-M4. The ability of various compounds to protect the growth of mutants is shown when added to the minimum development medium (+ indicates development, - indicates a lack of growth): Hastidine L-Histidinol Phosphate L-Histidinol Imidazole Acetol Phosphate M1+ M2+ + M3 + M4+ - - A pathway for biocinesis of its tidine. (M1 - M4 to denote the gene represented by these mutations Use. 10. 10. The table shows the ability of various mutant strains of neurospora that grow at moderate reduction on the intermediate medium in the deficiency of thiamine (vitamin) or synthesis of thiamine. Then, + indicates growth, - indicates a lack of growth. The complementary mutation was none thiamine pyrimidine thiazole-1-+++tha-2-+-tha-3-+-(i) Why do these data support the pathway by a branch for the synthesis of thiamine instead of a linear pathway? (ii) Propose a route for biosynthesis of thiamine. (To denote the genes represented by these mutations was-1, thi-2 and use thi-3.) 11. A plant that usually produces purple flowers was mutagnosized and the following phenotypes of tap mutations were observed: mutation phenotype p-blue flowers R-red flower p-r-blue flowers propose a genetic pathway for the color of flowers in this plant. 12. A separate plant produces flowers that are part white and part orange. Phenotypes of various tap mutations are indicated: mutation phenotype A- red and white flower C- completely orange flower A-B- completely white flower A- completely red flower B-c- completely white flowers suggest a genetic pathway for the color of flowers in this plant instead of orange and white B. 13. The general regulation of DNA synthesis in yeast depends on three genes, CLN, CLB and SIC. Phenotypes of various zero mutations are indicated: Mutation Phenotype CLB- No DNA synthesis CLB- Excessive DNA synthesis CLB-SIC-no DNA synthesis CLN-SIC-excessive DNA synthesis Clan-CLB-no DNA synthesis [Note: In real life, experiments will be complicated by the fact that these mutations will probably have fatal consequences. Don't let this happen that you're upset.] (i) Which gene is absolutely required for DNA synthesis? (ii) Propose a genetic pathway for regulation of DNA synthesis in yeast. [Some of these ovens are less than fresh — they're recycled from 1998, for crunch time. My apologies.] Quiz section #2 questions for Lecture 191, #3, and #9. In the fruit fly, black body (B) and low hairding (RD) are ineffective allels of linked autosomal genes. In a strain that was B+/+ rd, it was noted that flies sometimes showed small patches of ineffective phenotype — mostly black bodies and lone patches of twin patches — next to black-body patches less bristle patches. The lone black patch and twin patch occurred in a ratio of 5:6. (i) Explain how patches occurred, required with pictures of chromosomes and multiples (including centromere). (ii) Prepare a map of the chromosome showing the relative distance between centromere and each of the two genes. (iii) Close examination of flies revealed rare, lone patches of low colic. Suggest two different mechanisms do not include point mutations by which these lone patches might arise. 2. Mold (e.g. aspergillus) grows as disk expansion, new developments are being made On the outer edge of the colony. One consequence of this pattern of development is that myotic recombination, instead of giving patches in Drosophila, causes the area shown below. Genes for mold color (y += normal, Y = yellow, ineffective), colony morphology (R + = normal, R = rough edges, ineffective), growth density (g + = normal, g = sparse, ineffective), and highfall texture (M+= normal, M = mold, ineffective) are known to be added to one such mold. A haploid strain that shows all four common phenotypes, all four shows ineffective phenotypes. When the resulting diploids were grown, most colonies showed major phenotypes, but some areas of ineffective

phenotype were seen: 7 lonely yellow areas 32 rough areas that were adjacent to each yellow areas 12 lone areas of sparse development 6 areas of sparse development that were adjacent to the areas of each bizarre hyphae what is the arrangement of these four genes in relation to centromere? 3. You've heard in lectures about Kurt Stern's observation of yellow and rendered brimlessness after the mitotic recombination in yellow and flies asymmetry for sang. A distinct strain of flies that were also skewed for these two loki, saw single spots that showed both ineffective phenotypes (yellow and sung baltals in one place). Explain this observation. 4. A diploid mold strain that was skewed to each of the six ineffective mutations was examined for recombination areas. The results are tabulated below: Phenotype of Sector Number A B C D F 120 A B C D E 180 A B C D 330 A B C 150 A B 170 A 50 Gene Order (including Centromere) and relative map make a map of chromosome showing distance. Lecture 20-21 (These questions also appear on P92 of lecture notes. 5. A tumor can contain about 1 cubic centimeter in volume, about 109 cells in the size of a marble. How many cell generations (starting from the same cell) are required to produce this tumor? How many cell divisions were involved? 6. Some uterine tumors consist of as many as 1011 cells. Skewed in women for a particular X-linked gene, researchers have discovered that every cell of such tumors has the same active X-linked eyl. Explain this observation in the context of the Lyon hypothesis. 7. Although it is generally agreed that the path to malignancy is a multistep process, Weinberg and his colleagues were able to transform tissue culture cells into a move. Suggest an explanation for this obvious discrepancy. 8. Proto-oncogene erbyby encodes the cell surface receptor for a growth factor. Binding of the growth factor to the receptor indicates dividing the cell. Speculation on how a mutation in erbB proto-oncogene can lead to malignancy. 9. Protein product of Gene A, when activated, promotes cell proliferation. In calm (non-proliferation) cells, this gene has an action From the action of a second gene (B). Allils of wild types of genes A and B are A++ and B+respectively. (a) If the mutant of Gene A (Ayl A*) allows improper entry into the alle cell cycle, do you expect the mutation to be effective, profit-effective or ineffective loss of work? (b) If the mutant of Gene B (Ayl B*) allows improper entry into the alleal cell cycle, do you expect the mutation to be effective, profit-effective or ineffective loss of work? (c) If Allel mutates A* at a frequency of A+ 10-5, what is the probability of the cell of genotype A + A + B + + starting on the path of cell proliferation by mutation of gene A? Some tricky questions (try these without peeking at answers!): 1998 Problem Set 5, Q1, 2, 3 #4, #5, and Quiz Section #8 for Lecture 16 One. Shown below is the arrangement of genes on homogenous in an inverted asymmetry. The lower chromosome is inverted. Upper case = head; Centromere is indicated by a circle near the right hand end. A child was found to have the following arrangement of genes on a homogenous: diagrams to account for this arrangement of genes in the offspring of what you think would have occurred in meiosis in parents. 2. Phenotype mnpcurtw in a true reproductive diversity of the plant, while phenotype mnpcurtw in a different true reproductive diversity. F1 progeny from a cross between the two varieties is the phenotype MNPQRTW. An F1 x F1 cross gives F2 progeny of two phenotype classes: MNPQRTW and mnpqrtw. (a) Why is this result unpredictable? (b) The metosis was cycological tested at the F1 plant. In many anaphase I cells, the chromosome material was found to be stretched from one pole to another, eventually broken down to the end of the anphase. Suggest an explanation for this overview. Diagram the chromosomes involved. 3. Consider the following inverted heterotropi: Which of the following double crossover (DCO) scenarios will cause the biggest decrease in fertility, and why? (a) D-Centromere and Centromere -E interval (i.e., a crossover between D and Centromere, second crossover senromere and e) (b) Y-A and G-H interval in DCO (c) DCO Y-A and E-F in interval 4. In Drosophila, Scoot Bristles (SC) is ineffective; The gene is located close to the tip of the SC X chromosome. Women with scoot bristles (XscXsc) had intercourse with a normal-bristly (X+Y) male that was X-irradiated. Unexpectedly, one of the male offspring had normal bristles (SC+). This male was mixed with XscXsc women; About half of the 300 or so offspring were scooty women and the other half were normal bristle men. Explain these results. 5. A certain developmental disorder is associated with a specific chromosome transfer. A prevalent hypothesis is that shifting is a growth factor gene division (normal gene Here), while a minority approach is that the transfer is more than 10 kb away from the breakpoint gene. (a) Suggest a Southern Stain Experiment which you will do to distinguish between these hypotheses, including control. Ri in figure refers to EcoRI sites in normal DNA. Let's say you have the entire 2.5 KB Ecori piece available to use as a check. [Tip: What pattern of band would you expect for normal genes? What could be different if the transfer actually divides the gene?] (b) Suggest a fish experiment that you will do to distinguish between these hypotheses, including control. (c) which test would you feel more confident about, and why? Lectures 17 and 18 6. (a) Diagram All types of sex chromosomes are non-desjunctions which can occur in mayosis in XX women and XY men, I alone, Mayosis II, and both Mayosis I and Meosis II. Assume that more than one pair of centromerise fails to disinfestation at any one stage of mayosis, and shows both stages of mayosis. (There is no need to draw chromosomes; just use symbols like XX, XY, XO, etc. (b) The nondisjunction that you have listed in mayos (a)will give XY zygote from normal (XX and XY) parents? (Let's say non-education occurs in only one of the parents.) 7. A male Calico kitten was found in each of the two litter of kittens. In one of the litter, mom's fur was black and dad was orange; In the other litter, mom was Calico and dad was orange. Remember that the fur color is X-linked, and that orange (XR) is prominent for black (XR). (a) Why is the occurrence of male calico cats abnormal? What kind of misguided events could male calico cats give rise to? (b) For each litter, can you tell where the misleading incident took place in mother or father? 8. (a) If mutation occurs during gametogenesis such as X Inactivity Centre (XIC) removed from X chromosome - will the results be worse for male offspring produced from that game, or for a female child? why? (b) If an XX Zygote inherits a common X chromosome and an X chromosome from which the Xist gene has been removed, you think which of the two X chromosomes will become inactive as the embryo develops? why? (c) A current hypothesis is that the protein product of an autosomal gene protects an X chromosome from inactivity, so that an X is always active. Suppose the promoter of this hypothetical gene has a mutation, such as the gene normally produces double the protein. What phenotype would you expect for this strain with regard to X chromosome inactivity? (d) whether you would expect mutant phenotypes to be effective or ineffective in (c)? why? Selection from 1998 1-1998 Which of the following women would you consider to be more risk of having a Down syndrome child, and why? (i) A 22-year-old woman or a 38-year-old woman whose relatives are none Down syndrome had babies (ii) a 38-year-old woman with no family history of Down syndrome babies, Or a 22-year-old woman whose two of the female relatives have had Down syndrome babies 2-1998 give complete genetic explanations for each of these conditions: (i) Phenotypically normal parents who have red-green bland XO daughters, and phenotypically normal parents who are red-green bland YXX sons. [Remember that this form of colored is X-linked. (ii) A pair of otherwise identical twins, one of whom is normal and the other is Down syndrome. 3-1998 A partial map of some genes on one hand of the Drosophila X chromosome is shown: a new graduate student treats normal men with X-rays and peers them to completely homogenous ineffective (abdefg/abdefg) women. From progeny, she picks women out and peers them to completely ineffective (abdefg/Y) men. The resulting F2 offspring were phenotypes: 1010 ABDEFG (almost equal number of men and women) 1024 abdefg (almost equal number of men and women) 18 ABdeFG (almost equal number of men and women) 22 abDEfg (almost equal number of men and women) (i) What is unusual about these results? (ii) The student advisor takes a look at the results and concludes that they can be explained by the reversal. How can she refuse removal or transfer? (iii) Assuming that the advisor is correct, which section of the chromosome do you think is inverted? To explain. (iv) Suggest a molecular test of your hypothesis stating its projected result. Assume that you can do a radioactive check for any desired gene on the chromosome, and that you have a complete restriction map of the normal chromosome. (v) Explain two rare progeny classes in view of the hypothesis of chromosomal reversal. 4-1998 A long, tetraploid pea plant (genotype tttt) crosses a small, tetraplide plant (TTT). Assuming that long (T) is dominant, and it only takes a major allile to give a major phenotype, what proportion do you expect of progeny phenotype for this cross? (This one might take some thought— sketching out the different results of meiosis can help.) In 5-1998 peas, genes for plant height (T = tall, T = small, ineffective) and plant color (D = dark, D = light, ineffective) are known to be on different chromosomes. However, a plant breeder notices that when it crosses a special TTDD plant with an ineffective TTDD plant, the offspring are completely involved in TD and TD phenotype plants in equal proportions; Also, as usual only half as many were seeds. (i) What was unusual about this result? (ii) Suggest clarifications for the results. Quiz section Lecture 13, #2 for cont'd 1, #4, and #7. Evidence from the crime scene in a criminal case is compared with a suspicious DNA in relation to five polymorphic sites (PS1 via PS5), and both of a perfect match each is celebrated for Site. The population has the frequency of those alles: PS1, 0.01 and 0.02; PS2, 0.003 and 0.01; PS3, 0.07 and 0.04; PS4, 0.13 and 0.08; PS5, 0.04 and 0.05. An ideal match (for a different suspect) is also found in a different case; There, polymorphic sites ps6 was tested through PS10, and the allile frequencies were: PS6, 0.2 and 0.4; PS7, 0.15 and 0.35; PS8, 0.4 and 0.3; PS9, 0.3 and 0.6; and PS10, 0.2 and 0.3. If you were serving on the jury for each case, who would feel more confident about finding the culprit — suspect in case 1 or suspect in case 2? why? 2. An autosomal shown below is the legacy of the key feature. The numbers in each individual bracket below represent the number of two different polymorphisms repeated on alleles of loci - PS1 (red) shown in the first row and PS2 shown in the second row. (a) Which of the two polymorphic sites, PS1 or PS2, shows evidence of characteristic relationship? Explain how you came to your decision. (b) Which person shows proof of recombination between that polymorphic site and its associated characteristic? Lectures 14 3. Let's say a frameshift is random in relation to three genetic codes beyond the location of the mutation. What is the average length of peptide (in aminoacids), would you expect a ribosome to synthesize beyond a frameshift mutation before facing stop coding? 4. Are food color additives mutagenic? To address this question, mutations are set in drosophila similar to those carried out by Muller - that is, Xw/Xw starts with women and X+/Y men and F1 is looking for the absence of wildtype men in F2 after mating individual F1 women with men. As before, Xw allele is on a balancer chromosome to prevent crossovers. The difference in this set of experiments is that the men of the parents are fed with one in four substances. A group of men are fed chinese water as a control for the rate of spontaneous mutation. Men of parents in groups 2, 3, and 4 are each fed a different food color agent. The results have been shown (red-eyed male F2 cross with offspring and red-eyed male F2 progeny failing to produce): Treatment # Producing red-eyed male progeny in F2 of cross # failing to produce red-eyed male pro Chinese watergeny 6255 13 food coloring #1 4821 76 food color #2 9361 18 food color #3 5382 91 which food color, if any, Causes increased levels of mutanesis compared to the background rate of spontaneous mutanesis? Show your calculations. 5. Different molecules absorb light at different wavelengths. For any molecule, the absorption spectrum shows the efficiency of absorption of light at different wavelengths across the spectrum. Shown here is the absorption spectra of DNA (solid red line) and protein (broken blue line) for different wavelengths of UV light (nm = nanometers). If we were plotting Of mutanesis for these same wavelengths, what do you think the curves look like woild? Lectures 15 6. Six different human tissue culture cell lines were established; Each row had a repetition of a section of chromosome 3, which was detected by blurring and looking at the pattern of the band. The figure shows the normal pattern of bands 1 - 7; There were repetitive areas indicated in cell lines (for example, repetitive 1 repeats bands 1, 2 and 3). Cell lines were all tested for the production of two different enzymes (E and Z). Normal cells produce 60 units of enzyme E and 100 units of enzyme Z. Enzyme levels in six repetitive cell lines are shown below. Assuming that enzyme levels scales linearly with the number of copies of gene coding for enzymes, which band is most likely the gene for enzyme E? For Enzyme Z? Repetitive enzymes 1 2 3 4 5 6 E 92 59 61 58 88 93 Z 105 155 149 145 152 156 7. In Drosophila, A, B, C, D, E and F are autosomal loki that are connected, but not necessarily in that order. Homoginous ineffective (ABCDIF)/(ABCDIF) women are mated with a homojigus head (+ irradiated with X-rays. Most offspring showed major (wildtype) phenotype for all six genes. However, some offspring showed some ineffective phenotype, as shown: F1 strain froth #1 type a C #2 C #2 CF #4 #3 suggest an explanation for the DEF #5 CF #6 F(a) why some offspring showed ineffective phenotype. (b) what is the gene order of these six genes? To explain. A certain ineffective mutation in yeast (ade-) causes colonies to be red in color, while Ade+ colonies are white. Single cells of an asymmetrical Ade+/ade-strain were plated on the growth medium and allowed to grow in colonies. Most of the colonies were white, but some showed the red sector. Red-sector colonies showed differences in the size of the area: some red areas were small, while others were large, and in some instances, the red zone was actually half a colony. (i) Assuming that as a result of point mutations in all regions, how would you explain the difference in area size? How would you explain half the sector (i.e., half red, half white) colonies in particular? (ii) (This is a challenge. Counting the number of red areas gives you an idea of how often the mutation will have occurred in the population you're sampling — but it doesn't tell you the mutation rate for Ade locus (i.e., what percentage of partitions result in the mutation of Ade locus). How might you deduce the mutation rate in Ade locus using this sectoring assay? Quiz section lecture 11, #4 for cont'd1, #6, and #7. Acondroplacea is an autosomal dominant feature in humans. An unaffected boy whose parents were both affected had the following DNA constitution on a polymorphic site on chromosome 4: ---------->>>>---------- Where --- represents the non-CA sequence and each > DNA sequence represents ca. Two different DNA molecules are represented in the figure. Genes for achondroplasia or cannot be linked to this polymorphic site. Write a genotype of boy vih honor for akrondroplasia and polymorphic site. The next four questions are mostly for review; Some of this material was covered in a molecular biology review session on Oct. 11. If you have trouble with these questions, talk to one of us. We can either answer specific questions or suggest some remedial reading. 2. Two DNA samples (sample A and sample B, each containing a pure DNA species) were cut each with the restriction enzyme PstI. After the gel electrophoresis of two cut samples, it was observed that sample A Digest gave two DNA bands in the gel, while the digest of sample B gave only one band. (a) Which DNA was spherical and which was linear before digestion? Let's say each DNA has at least one cut site for PSTI. (b) if you do not know whether they have any cut site for PSTI or not, what conclusions can you draw about the circularity/linearity of DNA substrates? 3. The diagram shows a 20 kb (kb = kilobase pair = 1000 base pairs) pieces of DNA (horizontal line) with the locations of restriction sites cut to enzyme EcoRI (RI, marked above horizontal line) and HindIII (H3, horizontally below the line). Dotted vertical lines show the scale in KB. (a) In the appropriate lane of the outline of the gel (marked I, ii, iii), mark the locations of the DNA band if you will see by gel electrophoresis (or digest) with DNA: (i) EcoRI (ii) Hindii (iii) For each digest, that DNA is cut to complete (i.e., every available site has been cut). (b) Circle the bands in your gel diagram that will hybridized the check shown in the figure. 4. A certain bacterium contains a genome containing a linear double-stranded DNA molecule. DNA is digested in different combinations with three different restriction enzymes (Ava I, Bam HI, and CLA I). The size of the following DNA fragments were observed by gel electrophoresis after enzyme digest: digest products Eva I alone 12 KB, 48 KB bam HI alone 10 kg, 50 KB CLA I alone 18 KB, 42 KB Awa I + Bam HI 2 KB, 10 KB, 48 KB Awa I + Cla I 12 KB, 18 KB, 30 KB Bam HI + CLA I 10 KB, 18 KB, 32 KB (a) What is the size of the backioffage in KB? (b) Prepare a map (restriction map) of bacteriophage genome indicating the locations of bacterial enzyme sites and the distances between them in KB. Lectures 12 5. Let's say you want to PCR-magnify the gray-boxed segment of the following double-stranded DNA sequence: (a) Write the sequences of primer that you will use to grow as small segments as possible that include the full gray part. Let's say the primer should be 10 Long. Specify the 5' and 3' ends of the primer. (b) if you do 30 rounds of PCR, what would be the length of most of the products in Aadhaar pairs? (Asume that you are using the primer you have specified in (a)). 6. A certain autosomal ineffective disorder in humans is linked to the restriction block length polymorphism for enzyme Xba I as shown below: External two Xba sites are present in all all alles (general and disease) in the population, while one or both sites that are marked with esteris are missing in eliel associated with the disorder. (a) If an unaffected person is a carrier for characteristic, how would you determine the restrictions by Enzyme Digest and Southern Blotting? Your answer must state your expected results for a carrier versus a homologous unaffected person. Let's say you have a suitable source of DNA. (b) the number of different RFLP variant types (alles) that would be expected in the population for this locus? (c) the number of different genotypes to be expected? 7. A man who is skewed to an autosomal ineffective attribute (genotype = D/d) repeats 8 and 18 of a microsatellite sequence on a polymorphic site (i.e., repeat 8 in a homolog and 18 repeats in the other homolog). She weds an affected woman who is 7 and 15 that repeats at the same polymorphic site. (a) whether you would consider polymorphic alles to show a dominant/ineffective behaviour, an imperfect effective behaviour or co-dominance? why? (b) if they have a child, what are the possible genotypes of the child assuming that the symptom is unrelated to polymorphic locus? Include the possibility of each genotype. (c) the possible genotype of the child if the symptom is linked to the polymorphic site at a map distance of 20 cm? 8. Pedigree shows an autosomal ineffective characteristic; Showing alleles of a polymorphic locus beneath the pedigree is a prison representing that is very tightly attached to the couple as well as for their 8 children. Let's say no crossover is found in this family and fill in the phenotype of eight children (II-8 through II-1) in relation to the disease. Also assume that I-1 autosomal is skewed to ineffective characteristic. Lecture 13 (to be continued in 5 weeks) from 1998 9. The plot below shows linkage analysis of two human disease genes in relation to three polymorphic loki. Each curve represents the distribution of lod score versus recombination frequency for one of the polymorphic sites in relation to one of the disease genes. Build a linkage map that best fits the data shown. (Note: Pairs of data sets — e.g., 'A' and 'E' — are shown here as completely overlapping. You would generally not expect to find such a perfect overlap. Quiz section #2 for Lecture 91, #5 and #8. Let's say the Great Pacific is an international among 8% white stripe of all meioses in Northwestern Crooks Rascal-breath loci. What is the map distance between these two loki? 2. Consider the results of the following cross and resulting progeny (upper case = major, lower case = ineffective; progeny phenotypes are listed). Which loci can you assign to the same linkage group(s), and what are the relevant map distances? What is the arrangement of alles (CIS vs. Trans) in each odd parent? AaBb x aabb 51 AB 53 Ab 47 AB 49 AB AaDd x AADD 100 AD 5 AD 3 AD 92 AD AaFf x Aaff 16 AF 12 12 8 AF 136 AF 20 AF BBE X BB6 B.E.108 B.E.92 B.4 HO DDFF X DDFF 11 DF 108 DF 122 DF 9 DF 3. There are two rival factions between common genetics. A group believes that the taste is unrelated to locus (T = tart, major; t = sweet, ineffective) texture locus (f = fibrous, major; f = smooth, ineffective). Their bitter rivals argue that the two loki are connected at a distance of 44 cm maps. To end the common wars once and for all, the UN special science envoy steps in and does the following experiments. A completely homogenous major tension is completely exceeded with ineffective stress. The resulting double contrasting F1 tests are crossed, and the progeny phenotypes are: 281 tart, fibrous 219 tart, smooth 251 sweet, fibrous 249 sweet, smooth Do you think the messenger has successfully fixed the question which faction is right? If so, which? Provide statistical evidence to support your answer. What would you do (to settle the question) if you were the UN Special Science Rapporteur? Lectures 10 4. Igor Young, a keen young graduate student, is working on itching, sneezing, and bouncing, three ineffective, symptoms associated in mice. He wants to cross a three-point test and build a map of the area containing these three genes, so he sets across the following: Homozygous itchy mice are crossing mice that are itching, sneezing and bouncing. F1 progenies are itching, bouncing, sneezing crosses the test with mice; He plans to count the resulting offspring and locate the gene order and map distance. Where is the lacuna in his plan? (Explain. What genotype should he be using in his last cross? If you are told that bouncing is the middle gene, and that it is separated from 18 CEMs and sneezes from 12 cm, what offspring would you expect from your cross, and how many of each would you expect, if you count 1000 total offspring? 5. Trihybrid eggplant with hairy leaves, purple flowers and thorny stalks is tested with hairless leaves, white flowers and plants with smooth stalks. The progeny are as follows: phenotype number hairy, purple, prickly 10 hairy, purple, smooth 132 hairy, white, prickly 81 hairy, white, smooth 998 hairy, purple, prickly 1020 hairy, purple, smooth 101 hairy, white, prickly 150 hairy, white, smooth 8 achieves genetic map of three loos. What is the coefficient of coincidence? 6. Let's say you know about three Loci on the Drosophila X chromosome (say, A, B and C). If you wanted to cross a 3-point test to map three loki, how would you set the cross? (i.e., what genotype do you use for men and women in testcross?) Let's say you're starting with pure breeding stocks that show all three ineffective traits and pure reproductive stocks that all show three major traits, and show how you get the genotype used for testcross. What phenotype classes do you expect to see in your testcross progeny? (Don't worry about progeny numbers; just give progeny classes.) Lectures 11 7. Five mouse-human hybrid cell lines were examined for the presence of human enzyme Q (which is not created by mouse cells). In the table, + enzyme indicates the presence of Q activity, and - indicates the absence of an enzyme. Which human chromosome is used gene for enzyme Q? Cell line enzyme q activity the human chromosome present in cell line A-3, 4, 7, 12 B + 2, 6, 7, 8, 12, 14, 15 C + 2, 6, 8, 14, 15, 18, 22 D-6, 14, 15 E+ 8, 9, 13, 17 8. The table below shows which of the three human enzymes (G, AD and H) were present in each of the five mouse-human hybrid cell lines. Which human chromosome carries which enzyme gene? Cell Line Enzyme Current Human Chromosomes Cell Line AGG, AD, H1, 2, 3, 5, 9, 12, 14, Present in 21 bg, h2, 3, 9, 11, 12 c none 1, 2, 3, 12, 20 D ad 5, 14, 20 EG, H2, 5, 9, 10, 15 selection is required for pigment deposition in the iris of the old allele o human eye from old 1998-1 , while its ineffective allel o eye causes albinism. Color perception requires major allile D, while its ineffective allel D is associated with color blindness. Both genes are located on the X chromosome. (a) Assuming no cross, what would you predict should be the result of a cross between a woman with eye albinism which is common to color vision, and a man of iris has normal pigmentation but which is colorblind because of the ineffective de allele? (b) Assuming no cross (and assuming no errant events), a woman lists all possible consequences of a cross between a woman who is skewed for both traits and a man who is normal in relation to both symptoms. In 1998-2 Drosophila, Sable Body(s), Singled Bristol (SN), and Fudsed Vein (Fu) are ineffective allels of three linked genes (wild type, major alles S+, SN+, and Fu+). Trihybrid females had crossed three major traits showing males, And the progeny were phenotype: women S+ SN + Fu + 1029 Men: S+ SN + Fu + 69S + SN + Fu 321 S+ SN Fu + 17 S SN + Fu + 99 S SN Fu + 307 S SN + Fu 21S + SN Fu 91 S SN Fu 75 (a) Give parents' women and male genotypes , show the correct sequence of genes. (b) Create a genetic map of the area. (c) Calculate the coefficient of coincidence, and intervene (if any). 1998-3 Hybrid cell lines were examined by Southern Blotting for the presence or absence of human insulin gene DNA; The data are shown below. Identify the chromosome carrying the insulin gene. Note: Cell line names have been simplified, but the data are real: they come from an actual experiment, published in Nature in 1980, that determine which human chromosome is the insulin gene. Do cell line human insulin sequence exist? Human chromosomes present in cell line A yes 6 7 10 11 14 17 18 20 21 X B Yes 3 5 11 14 15 17 18 21 C Yes 4 5 10 11 12 17 18 21 D No. 8 10 12 15 17 21 X E No 2 5 6 10 12 18 20 21 x F No. 17 18 20 1997-4 The following pedigree shows the red-green heritage (G = Normal, G = Normal, G = Leisure, Colorblind) and haemophilia (H = normal, H = ineffective, haemophilic), two X-linked symptoms. (a) What is the genotype of each person in genealogy? Giving an alternative genotype if necessary, is as specific as possible. (b) Which person is definitely a recombinant? (c) the chances of h/h for Individual III-III? H/H? H/H? [Note that these three possibilities have to be added up to 1.] Let's say the color and haemophilia 3 map units are different, and it is III-3 Homojigus G/G. #7, #8, #10 and #15 for quiz section Lecture 5 1. In a binocular organism where the haeploid chromosome number = 9, how many multipliers exist: (a) Myotyotic Metaface I? (b) Meitic Metaface I? (c) Mayotic Metaface II? 2. Some organisms exhibit the transformation of generations- they may exist as haploid or as diploid forms. However, only one form of these undergoes mayosis. Which form is this, and why can't there be meosis in another form? 3. The metaphage shown here is a pair of homogenous: (a) If, after a split, you find that both daughters have the following chromosomes, was the division mitosis or mayosis? (b) If after a partition you find that the two daughters have the following chromosomes, was the division mitosis or mayosis? Lectures 6 4. Galactosemia (inability to digest milk sugar) and albinism (absence of melanin) are both inherited as ineffective disorders in humans. The gene included a map for chromosomes 9 and 11 respectively. (a) Using G/G for general/galatocemic, A/A for general/abino, and X/Y for X chromosome/Y chromosome, list all possible genotypes of sperm that a man who is a carrier for both disorders will produce, including the sex chromosome in your list of genotypes. (b) The man marries a galacticomic albino woman. What is the genotype of a sperm that will result in their first son, Galatocemic and Albino? (c) Diagram the metotic divisions producing this sperm. 5. Haemophilia is inherited in X-linked ineffective fashion; Normal Eli (H) is dominant for the affected (H). (a) the genotypes of parents in six possible encounters in respect of this gene? (b) These sexual intercourses From all are daughters (c) A couple has an affected daur and unaffected son. What are parents' genotypes? 6. With which way of inheritance is the disease (filled symbol) not compatible in this genealogy? What mode of inheritance do you think is probable? 7. With which method of inheritance is the disease (filled symbols) not compatible in this genealogy? What mode of inheritance do you think is probable? Can you say something about whether the disease is rare or not? Lectures 7 8. Squiggly-eyed male flies were crossed with normal females, and the resulting F1 were offspring: 122 normal men 131 squiggly-eyed women What is the genre of inheritance for squiggly eyes? What phenotype ratio do you expect for F2 (if you cross F1 women with F1 men)? 9. A/A, B/B, D/D, and E/E are loki on four different automosomes. If a cross AABbDdee x AaBbddEe is done, what fraction of the progeny will be: (a) Phenotype ABD (where upper case = major, less case = ineffective)? (b) Genotype is Aabbddee? 10. Chickens that show creeper phenotypes are lower than normal feather bones and leg bones. An independently different gene determines the color of white versus yellow skin. Chickens that were completely contrasting were matched with each other. Offspring 6:2:3:1 consisted of creeper white, creeper yellow, normal white, and normal yellow chickens in proportion. Explain the results. Lectures 8 11. Consider a family with three children. If you know that there are at least 2 children boys, what is the probability that the three boys are? 12. Wilson's disease is an ineffective disorder of copper metabolism in humans. One couple, both odd clients, plan to have six children. What is the likelihood that two children will actually be affected? What is the likelihood that at least two children will be affected? 13. The color of purple flower in peas (P) is prominent for white (P), and is prominent for tall (T) low (T). Plants that are heterogeneous for both symptoms are obtained themselves, and 3200 offspring are obtained. (a) Which offspring do you expect to see phenotypes, and how many of the phenotypes do you expect? (b) The actual results were: 1784 tall, purple 620 tall, white 612 short, purple 184 short, white test using chi-square analysis fit for these results goodness. 14. Returning to Purple Pea Flowers (Major) vs. White Pea Flowers (Ineffective) – A seed trader has collected a large batch of pea seeds from just what he thinks is a homozygous purple X homozygous purple cross. However, her apprentice unsettles her by claiming that the seed actually came from a heterographer X heterotropin cross. The trader thinks the apprentice is wrong, but decides that the best thing to do is sample some of the seeds (check them growing and coloring the flowers). What is the minimum number of seeds he should sample 98% sure cross heterozygot x heterogeneous was not? 15. IT An autosomal shows the legacy of ineffective characteristic. Assuming that individual II-4 identical is normal, what is the probability of children being affected IV-1? Which of the following methods of selection inheritance from 1998 1998-1 can explain this genealogy? Give reasons. Let's say the disease is rare. (i) Autosomal ineffective (ii) autosomal effective (iii) X-linked ineffective (iv) x-linked positive (v) Y-linked (vi) Sex-affected (vii) Sex-Limited 1998-2 Which of the following methods of inheritance can explain this genealogy? Give reasons. Let's say the disease is rare. (i) Autosomal ineffective (ii) autosomal effective (iii) X-linked ineffective (iv) x-linked effective (v) y-linked (vi) sex-affected (vii) sex-limited 1998-3 You were told about the primary exceptions in the lecture that Calvin Bridges mentioned in his cross of white-eyed female and red-eyed male fruit flies. In continuation of the experiment, she crossed white-eyed, elementary extravagant women with red-eyed men. Among the offspring were secondary exceptions - white-eyed women and fertile, red-eyed men. Drawing on your knowledge of meiosis, explain how these secondary exceptions might arise. 1998-4 A couple, both contrasting to albinism, have five children. (a) What would be the possibility of the following phenotype in the order mentioned to the children? First child = normal; Second child = normal; Third child = albino; Fourth child = albino; 5th child = albino (b) What are the chances of five children, two normal and three albino, in any order? (c) what is the possibility that all the five would be normal? (d) what is the possibility that at least one child will be albino? #3 and #5 for quiz section Lecture 1-2 1. The height (T) of the tall plant in peas is prominent at the height (T) of small plants. (a) If long plants with true breeding are crossed by small plants with pure breeding, would you expect to see genotype and phenotype in F1? (b) if F1 plants are obtained on their own, and 10 F2 plants are obtained, how many of them would expect true breeding if you own? (c) A long plant of unknown history is tested-crossed, and as a result the offspring are all long. Draw the cross, including the most likely genotype of parents and offspring. (d) if the long plant is considered heterogeneous, what phenotype ratio do you expect in children? 2. Known phenotype but peas plants of unknown genotype were crossed as shown below. What is the most likely genotype of parents in each cross? Parent progeny (a) tall x tall 160 tall, 0 short (b) tall x tall 215 long, 70 short (c) tall x short 122 long, 128 small (d) tall x short 232 long, 0 small (e) short x short 0 long, 171 short 3. The long children from the top cross (a), (b), (c), and (d) were themselves. In each experiment (A-D), which part of the cross do you expect small plants to emerge? 4. In humans, Free-hanging earlobs are prominent when there are enclosed earlobs. A married couple both have free earlobes, though they each have a parent with attached earlobes, and their only child is to attach earlobes. Draw a pedigree for this family, indicating genotype where possible. 5. Free executions in humans continue with enclosed earlobs versus.. ı (a) List all possible sexual intercourses (parents' genotypes) that may result in an odd child (b) of these possible sexual intercourse, which gives the largest proportion of heterogeneous offspring? (c) which mating (a) will produce only one genotype child? (d) which mating (a) will produce two genotype offspring? (e) which of these two lists (C and D) does not include sexual intercourse? Lectures 3.4 6. Curly winged Drosophila, when matched with true breeding wildtype (normal winged) strains, produces curly winged and normal winged offspring in a 1:1 ratio. (a) Point to the genotype of two strains (create your own allile designation). Which phenotype is dominant? (b) Suppose the curly wing condition is fatal when homojigous. If curly-winged F1 flies are to cross each other (i.e., curly wings X curly wings), what fraction of progeny will true reproduction? 7. The base ratio of a certain DNA molecule (A+G) / (C+T) = 0.81. Are these molecules single-stranded or double-stranded? To explain. 8. The base ratio of a different DNA molecule (A+G) /(C+T) = 1.0. Testing the base structure indicates that cytosine content is 19%. What is the thymine content of the molecule? 9. Consider a plant of genotype TT. How many T-alles and T-alles will be a cell of this plant in the metaface of mitosis? 10. Gene coding for beta chains of hemoglobin can contain many different alleles, the most common of which are HBA, HBS, HBE and HBC. What are all genotypes possible with these four alles? How many of them can be homojigus? Selecting from 1998 while on a hike near Mount Rainier, you discover a patch of plants that, according to your botanist friend, all belong to the same species. However, the plants came in three varieties - some produce red flowers, some blue and some white. You secretly dig two red flowering plants, a blue flowering plant and a white flowering plant and bring them back to your laboratory. The results of the various crosses are as follows: Cross progeny (a) red flowering plant #1, sved 3/4 red-#2, 1/4 blue-flowering plants, self-made 3/4 red-flowering plants, self-containing 3/4 blue 1/4 white flowers (d) red plant #1 x red plant #2 3/4 red-red, 1/4 Blue Flower (E) Red Plant #1 X Blue 1/2 Red - , A/2 Blue-Flowered (f) Blue-Flowered X White - Flowers 1/2 Blue - 1/2 Blue 2 White Flowering (G) White Flowering Plant, Selfed All White-Flower (H) Red Plant #2 X Blue (**i.e., 3/4 Offspring Make Red Flowers and 1/4 Blue Flowers -- No Each flower is 3/4 red and 1/4 blue!) Come up with an integrated hypothesis to explain these results. Your answer should show the genotype of all the plants concerned. Based on your hypothesis, predict the results of the cross (H). With regard to ABO blood types, what is a cross that can give all four possible phenotypes between offspring? progeny?