Sadava, Hillis, Heller, Berenbaum

La nuova biologia.blu

SOLUZIONE DEL *LEARN BY DOING*

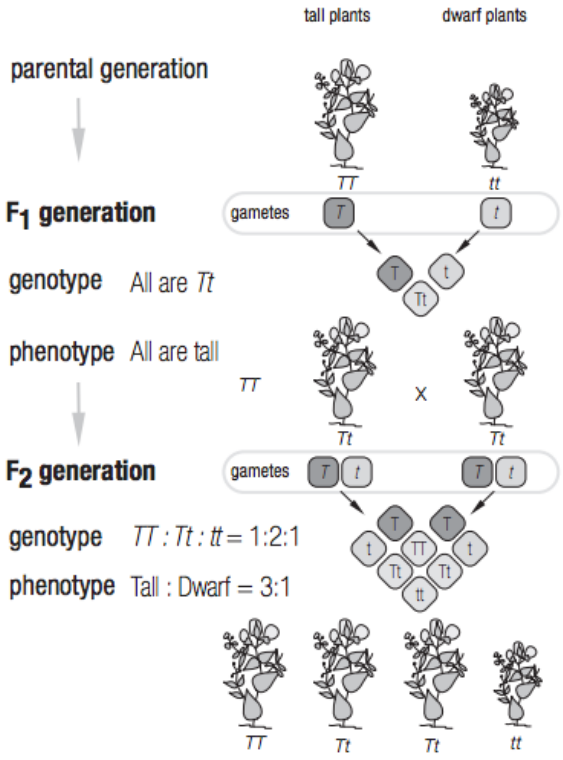
Di seguito sono riportate le soluzioni degli esercizi delle sezioni *Learn by doing*, esercizi con approccio CLIL dei principali argomenti di biologia.

1. GREGOR MENDEL

A

1. False – His work had no discernibile influence on the scientific community forabout 30 years
2. True
3. False – This is the definition of character. A trait is a particolar form of a character, e.g. white or purple flower
4. False – F2 plants
5. False – The ratio of dominant-recessive
6. True;
7. False – He had no knowledge of chromosomes or meiosis;
8. True

B



C

1. To avoid self-pollination
2. He had isolated each strain by crossing sibling plants or allowing self-pollination
3. Yes

2. GENOTYPE AND PHENOTYPE

1f, 2c, 3j, 4a, 5i, 6b, 7h, 8d, 9g, 10e

3. MENDEL'S LAWS

a. Diploid
b. True-breeding
c. Phenotype
d. Haploid
e. Parental generation P
f. Law of independent assortment
g. Second filial generation F2
h. Pleiotropic

4. FAMILY TREE

a. It is recessive because A and his husband do not have the condition, but they have a son that is polydactyl
b. A-*Pp*, B-*Pp*, C-*pp*

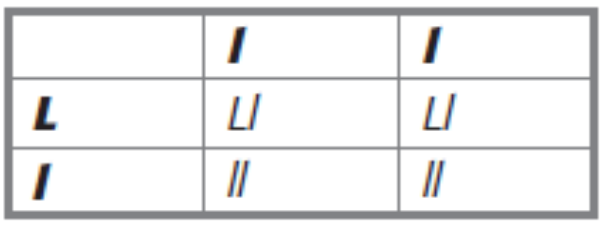
5. A GENETIC DESEASE: SICKLE CELL ANEMIA

disease; amino acid; allele; red blood cells; capillaries; oxygen; parasite; carrier; malaria; plasmodium

a: ss
b: Both Ss
c: 1/2
d: 1/8

6. FRUIT FLIES

a. The first fly was homozygous recessive, while the second was heterozygous, as the diagram shows and in which we can see that the probability of each phenotype is 50%.
b.



7. PLANT BREEDING

a. Genotype: *RrTt*
b. Phenotype: Yellow fruit, tall
c. *RrTt* X *rrTt*.
d.

	rT	***rt***
RT	*RrTT* Red fruit, tall	*RrTt* Red fruit, tall
Rt	*RrTt* Red fruit, tall	*Rrtt* Red fruit, short
rT	*rrTT* Yellow fruit, tall	*rrTt* Yellow fruit, tall
rt	*rrTt* Yellow fruit, tall	*rrtt* Yellow fruit, short

8. INHERITANCE

a. mitosis (meiosis)
b. recessive phenotype (dominant)
c. mitosis (meiosis)
d. wild allele (pleiotropic allele)
e. law of assortment (law of segregation)
f. Mendel (Morgan)
g. characters (genes)
h. Y chromosome (X)

9. COLOR BLINDNESS

a. *False* – The phenotype appears much more often in males than in females
b. *True*
c. *False* – This disease appears only if X chromosome is present
d. *False* – Daughters who receive one mutant X chromosome are heterozygous carriers
e. True
f. True

10. DROSOPHILA MELANOGASTER

1. Fruit flies lay many eggs and have large numbers of offspring (high fecundity)
2. The fruit fly life cycle is short and determined by temperature so it is possible to have results very quickly
3. They have clear features and there are obvious differences between males and female
4. They have very small size so little space is required (ease of culturing)

11. GENETICS

a. (*T*=tall, *t*=short, *S*=smooth, *s*=wrinkled)

	TS	**Ts**	**tS**	**ts**
TS	*TTSS* Tall smooth	*TTSs* Tall smooth	*TtSS* Tall smooth	*TtSs* Tall smooth
Ts	*TTSs* Tall smooth	*TTss* Tall wrinkled	*TtSs* Tall smooth	*Ttss* Tall wrinkled
tS	*TtSS* Tall smooth	*TtSs* Tall smooth	*ttSS* Short smooth	*ttSs* Short smooth
ts	*TtSs* Tall smooth	*Ttss* Tall wrinkled	*ttSs* Short smooth	*Ttss* Short wrinkled

The phenotypic ratios are as follows: 9 tall smooth; 3 tall wrinkled; 3 short smooth; 3 short wrinkled.

b.

Case 1 (T=tongue-rolling and t=non-tongue-rolling):

	T	**t**
T	*TT* Tongue-roller	*Tt* Tongue-roller
t	*Tt* Tongue-roller	*Tt* Non tongue-roller

The genotypes and ratios are 1 *TT* : 2 *Tt* : 1 *tt*.

Case 2

	T	**T**
t	*Tt* Tongue-roller	*Tt* Tongue-roller
t	*Tt* Tongue-roller	*Tt* Tongue-roller

All the children will be tongue-rollers.

c.

Case 1

F1 generation: *PpSs*, all wild-type. *PpSs* X *PpSs*

	PS	**Ps**	**pS**	**ps**
PS	**PPSS**	**PPSs**	**PpSS**	**PpSs**
Ps	**PPSs**	**PPss**	**PpSs**	**Ppss**
pS	**PpSS**	**PpSs**	**ppSS**	**ppSs**
ps	**PpSs**	**Ppss**	**ppSs**	**ppss**

16 combinations of gametes in this dihybrid cross result in 9 different genotypes. F2 in a ratio of 9 : 3 : 3 : 1 in phenotypes.

Case 2

The genotypes are: *PpSs*, *Ppss*, *ppSs*, ppss; the ratio is 1: 1: 1: 1; the phenotypes are: wild eye, long wing; wild eye, short wing; pink eye, long wing; pink eye, short wing; the ratio is 1: 1: 1: 1.

12. MENDEL AND BEYOND

Across

1. CODOMINANCE, 4. GAMETE, 5. GENOTYPE, 7. MONOHYBRIDCROSS, 10. GENE, 12. ALLELE, 16. CHROMOSOME, 17. TESTCROSS, 18. PHENOTYPE, 19. PUNNETTSQUARE.

Down

2. DROSOPHILA, 3. RECESSIVE, 6. DIHYBRIDCROSS, 8. HETEROZYGOUS, 9. CHARACTER, 11. DOMINANT, 13. LINKAGEGROUP, 14. HOMOZYGOUS, 15. TRAIT.

13. THE HERSHEY-CHASE EXPERIMENT

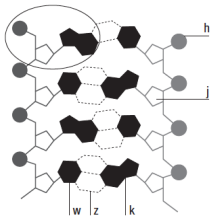
genetic material, bacterium, virus, bacteriophage, DNA, protein, reproduce, trace, ^{32}P, phosphorus, ^{35}S, sulfur, phosphorus, sulfur, separate, inject, reproduce, separately, agitated, dislodge, bacterial cells, spun, heavier, bottom, pellet, lighter, supernatant, pellet, supernatant, radioactivity, sulfur, supernatant, did not enter, phosphorus, pellet, entered, DNA, protein.

14. MOLECULAR ARCHITECTURE OF DNA

1. *True*; 2. *False*; 3. *True*; 4. *False*; 5. *True*; 6. *False*; 7. *True*; 8. *False*; 9. *True*; 10. *True*.

15. THE DNA

a. Nucleotide



b. Phosphate

c. Deoxyribose

d. W: thymine, K: adenine – Because there are only two hydrogen bonds between molecule

e. Z: cytosine – Because there are three hydrogen bonds between molecules

f. Phosphodiester bonds that are covalent bonds, between the third and fifth carbon atoms of adjacent sugar rings

g. The direction of the nucleotides in one strand is opposite to their direction in the other strand; the asymmetric ends of DNA strands are called 5′ (five prime)

and 3′ (three prime) ends, with the 5’ end having a terminal phosphate group and the 3’ end a terminal hydroxyl group.

16.DNA REPLICATION

a-3, b-2, c-7, d-4, e-1, f-9, g-5, h-8, i-6

17.COMPLEMENTARY BASES

a. 3′-ATTCCG-5′
b. 3′-TAAGGC-5′
c. 3′-TGGAAT-5′
d. 3′-GCCTTA-5′
e.3′-CGGAAT-5′

18.PROTHEIN SYNTHESIS

A.

1: nucleus; 2: cell membrane; 3: cytoplasm; 4: DNA; 5: mRNA; 6: tRNA; 7: mRNA; 8: ribosome; 9: polypeptide.

B.

a. Transcription

b. Translation

c.Transcription is the first stage of the expression of genes into proteins. In this enzymatic process RNA is synthesized using a DNA template in a process made up of three stages: initiation, elongation and termination, at the end of which the mRNA is moved out of the nucleus. The mRNA contains the instructions to make one single protein.

C

cytoplasm, tRNA, enzyme, ATP, transcription, mRNA, first, polypetide, subunits, ribosome, start codon, added, 5′→ 3′, stop, codon, protein, released

19.MUTATIONS