Quizlet WSET Level 4 Diploma Unit 2 - Viticulture

Study online at quizlet.com/_3w6f0

1.	**Basic building block of the vine**	GLUCOSE - combines to produce cellulose for roots, trunks, shoots, leaves and fruit - tannins, acids and flavor molecules in the grape
2.	**Important environmental needs for vines**	Sunlight, water & carbon dioxide - photosynthesized by Chorophyll to produce glucose - CO2 always available, so only sunlight and water matter
3.	**What affects the metabolism of the vine?**	Temperature
4.	**Vines' dormancy temperature**	10 C
5.	**Vine growth to peak temperature**	22-25 C
6.	**Too high temperature for vine growth**	25 C - Growth slows because vine's metabolic needs increase faster than its ability to photosynthesize sugars
7.	**Growing season in the northern hemisphere**	April to October
8.	**Growing season in the southern hemisphere**	October to April
9.	**The annual weather pattern of an area averaged over several years**	Climate
10.	**Climate parameters**	Rainfall Temperature
11.	**Regional climate classification (by temperature)**	Cool Moderate Warm Hot
12.	**Average mean temperature of cool climate**	Below 16 C
13.	**Typical cool-climate regions**	Champagne Mosel Southern England Anderson Valley Tasmania Carneros
14.	**Cool-climate wines**	Early ripening varieties e.g. Chardonnay, Pinot Noir
15.	**Average mean temperature of moderate climate**	16.5-18.5 C
16.	**Typical moderate-climate regions**	Bordeaux N Rhone Rioja Piedmont Tuscany Coonawarra Marlborough Napa Sonoma
17.	**Moderate-climate wines**	Medium-bodied wines from intermediate-ripening varieties e.g. Cabernet Sauvignon, Merlot, Sangiovese
18.	**Average mean temperature of warm climate**	18.5-21 C
19.	**Typical warm-climate regions**	S Rhone Douro Jerez McLaren Vale Paarl
20.	**Warm-climate wines**	Heat-loving varieties e.g. Grenache, Mourvedre, Ruby Cabernet Fortified wines
21.	**Average mean temperature of hot climate**	Over 21 C
22.	**Typical hot-climate regions**	San Joaquin Valley, CA
23.	**Hot-climate wines**	Table and drying grapes
24.	**Difference between the average mean temperature of the hottest month and the coldest month**	Continentality
25.	**Regional climate classification (by degree of "continentality")**	Maritime Mediterranean Continental Tropical
26.	**Maritime climate characteristics**	Low annual range of temperature Warm summers and mild winters Relatively high rainfall and cloud cover Near large bodies of water

27.	**Typical maritime-climate regions**	Bordeaux Eastern coast of New Zealand S England
28.	**Maritime-climate wines**	Medium-bodied wines with moderate alcohols e.g. Bordeaux reds and whites, Muscadet, Rias Baixas, Vinho Verde
29.	**Mediterranean climate characteristics**	Low annual range of temperature Warm sunny summers and mild winters Dry summers with most rain in winters Long growing season
30.	**Typical Mediterranean-climate regions**	Mediterranean West coast of the United States Chile SE Australia W Cape, S Africa
31.	**Mediterranean-climate wines**	Full-bodied, rich-textured reds with ripe tannins
32.	**Continental climate characteristics**	Wide annual range of temperature Hot summers and cold winters Inland Dry Short growing season
33.	**Typical cool continental-climate regions - continentality and long day length - cool autumns**	Burgundy Champagne Northern regions of Germany British Columbia Alsace Austria
34.	**Grapes in regions with continentality and long days**	Early-ripening varieties - Riesling - Pinot Noir
35.	**Cool continental-climate wines**	Intensely-flavoured, late-harvested whites High alcohols Sweet wines
36.	**Typical warm continental-climate regions**	Mendoza Central Europe Central Spain
37.	**Warm continental-climate wines - long warm autumns**	Malbec Cabernet Saurignon

38.	**Tropical climate characteristics**	Minimal annual range of temperature Hot summers and warm winters Rainfalls more deciding factor Unsuitable for high quality viticulture Shortened vine productive lifespan
39.	**Typical tropical-climate regions**	Brazil India Thailand
40.	**What is aspect? How does it affect a vineyard?**	Direction a vineyard slope faces - an important characteristic of a vineyard site - determines exposure to sun
41.	**Preferred aspect in cool climates in northern hemisphere**	South facing - warmer - aiding the ripening process
42.	**What is slope? How does it affect a vineyard?**	Degree of incline - determines intensity of sunlight received
43.	**Advantages of east facing vineyards**	Sun's rays scattered less in the morning, when the earth has cooled overnight, and dust has settled
44.	**Disadvantages of west facing vineyards**	Sunlight scattered more by dust that has been lifted by warming air during the day; Face damper, cooler prevailing weather conditions
45.	**Aspect and slope for locations that would otherwise be too hot**	Slopes that face away from the equator
46.	**Influence of slope or incline on a vineyard**	Sunlight interception Air movement Soil properties Cost of working the land
47.	**Advantages of sloping vineyards**	Air movement on slopes (i.e. cold and dense air move downhill displacing warm and less dense air to produce warm thermal layers on the slope) deters frost and offers slightly improved ripening potential; Soils on slopes tend to be poorer, more coarse for better drainage
48.	**Disadvantages of sloping vineyards**	Increased risk of erosion; Higher costs (manual), e.g. the Mosel Valley

49.	**Ideal vineyard sites**	Isolated hills - no big currents of colder air flowing down from the main hills e.g. Burgundy's hill of Corton at Aloxe-Corton, Montagne de Reims in Champagne
50.	**Effects of canopy management**	Affect climate in the fruiting zone, therefore style and quality of wines
51.	**Effects of thick vigorously-growing canopy in cool-climate regions**	Reduce flower initiative and berry set due to shading; Higher acid retention due to cooling; Reduce sugar accumulation due to humidity & shade; Encourage competition for sugar
52.	**Temperature's effects on yield**	Rate of growth; Number of flower clusters and size; Success of the setting of flowers into berries
53.	**Conditions for finest tastes and aromas**	Slow, cool, berry ripening
54.	**Temperature's effects on quality**	Level of yield; Accumulation of sugars and reduction of acidity; Development of wine aromas Phenolic ripeness (tannins)
55.	**Low winter temperatures**	Freeze injury to domancy at -15 C; serious injury at -20 C; fatal at -25 C
56.	**Protection of vines against very low temperatures**	Insulation by snow or earth pushed up around the vine
57.	**Too cold site for viticulture**	below -20 C more than once every 20 years; or mean temperature for coldest month below -1 C
58.	**Amerine & Winkler's Heat Summation System (1944) - mainly used in CA**	Growing Degree Days (GDD) = (mean temperature for the month - 10) x no of days in the month Sum of GDDs for 7 month growing season
59.	**Amerine & Winkler's Category I**	GDD < 1370 (2500) Anderson Valley, Caneros, Edna Valley, Marin, Mendocino, Monterey, Napa, Russian River Valley, Santa Clara, Santa Cruz Mountains, and Sonoma cf. Champagne, Cote d'or, Rhine, Friuli, Tasmania, Marlborough, Willamette Valley (OR) finest light white wines (riesling, chardonnay) pinot noir
60.	**Amerine & Winkler's Category II**	1370 < GDD < 1650 (2501 - 3000) Napa, Alexander Valley, Chalk Hill, Potter Valley cf. Bordeaux, N Rhone, Alsace, Yarra Valley, Frankland River premium medium-bodied reds (cabernet sauvignon, merlot, syrah) chardonnay, semillon, sauvignon blanc
61.	**Amerine & Winkler's Category III**	1650 < GDD < 1930 (3001 - 3500) Paso Robles, Lake, McDowell Valley, San Benito cf. Barossa Valley, Stellenbosch, S Rhone, Clare Valley, Lower Hunter, Rioja, Piedmont premium full-bodied reds (zinfandel, grenache, barbera, tempranillo, syrah, gamay, carignan, ruby cabernet)
62.	**Amerine & Winkler's Category IV**	1930 < GDD < 2200 (3501 - 4000) Amador cf. McLaren Vale, Upper Hunter, Langhorne Creek, Montpellier best fortified wines carignan, cinsault, mourvedre, tempranillo
63.	**Amerine & Winkler's Category V**	GDD > 2200 (4000) San Joaquin cf. Greek Islands, Jerez, Sicily, Sardinia bulk wines, table and drying grapes primitivo, nero d'avola, palomino, fiano

64.	**Why Amerine & Winkler Heat Summation System works in CA, but not Australia?**	In CA, many factors correlated with degree days (e.g. temperature variability, sunlight, humidity); or don't vary greatly across region (e.g. sunlight angle, day length)
65.	**Limitations of Amerine & Winkler Heat Summation System**	Nonlinear relationship between vine growth and temperature; Vine growth slows significantly when > 30 C
66.	**Smart and Dry System (Australia)**	mean temp of warmest month (July/Jan) with corrections for continentality, sunlight hours and day length (latitude), humidity, rainfall and evaporation
67.	**Key features of EU zones of production**	As the region gets warmer - min potential alcohol requirement increases; - level of must enrichment decreases; - illegal deacidification, legal acidification
68.	**EU Region A**	Germany (excl Baden), UK; Min 5% abv; Max 3.5% - 11.5% enrichment (12% for reds); -1 - 0 g/L acid adjustment
69.	**EU Region B**	Loire, Champagne, Alsace, Austria; Min 6% abv; Max 2.5% - 12% enrichment (12.5% for reds) -1 - 0 g/L acid adjustment
70.	**EU Region C1a**	Bordeaux, SW France, Rhone, Vinho Verde; Min 7.5% abv; Max 2%-12.5% enrichment; -1 - 0 g/L acid adjustment
71.	**EU Region C1b**	Hungary, Trentino-Alto Adige; Min 8% abv; Max 2% to 12.5% enrichment; -1 - +2.5 g/L acid adjustment
72.	**EU Region C2**	Languedoc-Roussillon, Provence, N Spain ex Atlantic coast, Italy; Min 8.5% abv; Max 2% to 13% enrichment; -1 - +2.5 g/L acid adjustment
73.	**EU Region C3a**	Parts of Greece Min 9% abv; Max 2% to 13.5% enrichment 0 - +2.5 g/L acid adjustment
74.	**EU Region C3b**	Portugal (ex Vinho Verde), S Spain, Puglia, Sicily, most of Greece; Min 9% abv; Max 2% to 13.5% enrichment; 0 - +2.5 g/L
75.	**Water-stress on wine quality**	Some stress during berry maturation improve quality; Severe stress is detrimental
76.	**Precipitation needed**	Cooler regions : about 500mm/yr Hotter regions: as much as 750mm/yr
77.	**Factors affecting water requirements during growing season**	vine density; soil water holding capacity; time of rainfalls
78.	**How many litres of rain does a vine get a year in La Manchai planted at 1,000 vines per hectare with 300 mm precipitation?**	3,000 litres
79.	**How many litres of rain does a vine get a year in Bordeaux planted at 8,000 vines per hectare with 800 mm precipitation?**	1,000 litres
80.	**Disadvantages of excess rain**	Cool the mesoclimate; More difficult for machinery to work; Increase risk of fungal disease; Reduce fruit set (esp. in low temp); Brunch compaction and berry splitting; Dilute must if rains before harvest
81.	**Purpose of sunlight**	Energy source for vines to build sugars Increase temperature of vineyard

82.	**Effects of sunlight in cool temperatures**	Rate of photosynthesis slows; Increase leaf area and canopy to compensate; Exposure of fruit to sunlight enhance ripening; Eliminate pyrazines in Bordeaux varieties
83.	**Exposure of fruit to sunlight**	Increase rate of ripening; Increase risk of sunburn;
84.	**Effect of day length (photoperiod)**	Regions in high latitudes have longer summer days (more exposure to sunlight) to offset lower temperatures e.g. Mosel, S England, Central Otago
85.	**Effects of sunlight on vine growth**	Indirect effect due to heat accumulation; Direct effect on bud viability, flowering, berring ripening, and cane/shoot maturation; Direct effect on photosynthesis
86.	**Effects of sunlight on yield and quality**	Amount of sugar produced by photosynthesis - warm & cloudy (Hunter Valley) --> low sugars; - cool & sunny (Central Otago) --> high sugars
87.	**Sunlight required for vitis vinifera**	> 1250 hours of sunshine to produce ripe fruit
88.	**Proximity to large town or city**	10% less sunlight due to pollution
89.	**Geographical features affecting climate**	Bodies of water; Ocean currents Forest Altitude and mountain ranges
90.	**Advantages of proximity to bodies of water**	Store heat Reflect sun's rays; Souce of irrigation; Reduce risk of ground frost; Morning mists for "noble rot"
91.	**Disadvantages of promixity to bodies of water**	Increase humidity, therefore, risk of fungal disease, e.g. downy mildew
92.	**Effects of ocean currents**	Create cooling mists and fogs e.g. Pacific Ocean current off California; Humbolt current off Chile Warm up the climate e.g. Gulf stream on west coast of UK
93.	**Proximity to forests**	Pros: windbreaks; store heat; reduce erosion Cons: cool the mesoclimate in warm weather and increase humidity; birds
94.	**Effects of altitude**	Mean annual temp decreases by 0.6 C for every 100m rise in altitude (or a reduction of 105 degree-days a year) Increase the cooling effects of wind exposure
95.	**Mountain ranges**	Protection from excessive wind and rain (rain shadow) e.g. Alsace & Vosges mountains
96.	**Purpose of soil**	Support vine; Provide nutrients
97.	**Soil characteristics**	Nutrients Pets & rootstock Water holding capacity and availability Heat retention Fertility
98.	**Soil fertility**	Soil texture Soil structure Organic matter content Mineral content Availability of air and water Level of acidity/akalinity
99.	**Soils with low fertility**	Vines grow best on these soils - restrict canopy growth; - often stony and well-drained
100.	**Soil texture**	Size of particles clay < 0.002mm silt < 0.02mm fine sand < 0.2mm sand < 2mm gravel > 2mm Relative proportion - water holding capacity and availability - soil temperature - availability of nutrients
101.	**Heavy soils**	High clay or silt content Hold more water
102.	**Lighter soils**	More sand and gravel More free-draining
103.	**Advantages of clay soils**	More moisture More nutrients (negative charge)

104.	**Disadvantages of clay soils**	Take longer to heat up in spring and tend to be colder all year round (coz water); Swell when they absorb water and shrink when dry leading to cracking and water loss; Sticky when wet; Wet clay soils' structure deteriorates when worked
105.	**Loam**	Balanced mixture of clay, silt and sand Both nutrient holding abilities of clay and good drainage of sand
106.	**Soil types**	Limestone Chalk Slate Granite Volcanic rocks
107.	**Limestone**	Sedimentary rock from deposition of shells & skeletons of marine life; mainly calcium carbonate; alkaline & free draining e.g. central and eastern Loire, Piedmont, N Spain, Burgundy, Limestone Coast Zone in S Australia Limestone-rich soils inhibits uptake of iron & other micronutrients (risk of chlorosis)
108.	**Chalk**	Lower density than limestone; better drainage e.g. Champagne, Jerez
109.	**Other sedimentary rocks**	Dolomite - similar to limestone but with high level of magnesium Sandstone - compressed sand and quartz Shale - soft clay
110.	**Slate**	Shale that has been altered by high pressures and temperature; harder and less porous than shale; heat retention e.g. Mosel
111.	**Granite**	Igneous rock from solidified magma from volcanoes; extremely hard and desnse but free-draining e.g. Baden, N Rhone, Beaujolais
112.	**Volcanic rocks**	Lava on surface e.g. Santorini, Madeira
113.	**Soil structure**	Way soil forms lumps or crumbs Affects availability of water, air & nutrients Influenced by - organic matter - earthworms and other soil organisms - wetting and drying - freezing and thawing - pressure of plant roots - cultivation and othe soil management practices - texture - drainage - compaction (tractors)
114.	**Good soil structure**	Stable crumbs of 1-5 mm in diameter 3-10% organic matter
115.	**Effects of poor soil structure**	Capping or crusting (hardened soil surface) Puddling (rain water stays on surface) Sieving (clay forms lower layer to block drainage)
116.	**Organic content (humus)**	Plant & animal remains Sugars, starches, cellulose, nitrogenous compounds Lignin and mineral matter
117.	**Soil organisms**	Break down sugars, startches, nitrogenous compands and some cellulose by "mineralisation"
118.	**Humus**	Partially decomposed organic matter
119.	**Benefits of humus**	maintain soil structure; retains nutrients; holds water; low plasticity and cohesion for easier soil management; gradual release of nutrients as humus slowly mineralised; darken colour to retain heat
120.	**Purpose of water**	Stop cells wilting Provide nutrients Main factor affecting vine growth
121.	**Water-holding capacity of soil**	Soil structure and humus content
122.	**Soil aeration**	Aid aerobic and suppress anaerobic organisms Remove CO_2 and other waste gases Provide oxygen to roots (respiration & growth)
123.	**Soil compaction**	Caused by tractors Lead to poor rain infiltration (erosion) Reduce drainage, aeration & root penetration

124.	**Effects of poor drainage**	Cooler soil, longer to heat up in spring Restrict root growth Reduce bearing capacity of soil, causing problems when machinery passes
125.	**Macronutrients**	N - plant cells, nucleic acids, chlorophyll and hormones; second to water for plant growth P - energy fixation, root growth, ripening K - regulate flow of water and sugar, ripening Ca - regulate cell acidity, cell walls S - amino acids and enzymes Mg - chlorophyll, regulate acidity, sugar metabolism, ripening
126.	**Micronutrients**	Boron Manganese Copper Iron Molybdenum Zinc Cobalt Chorine Silicon
127.	**Soil acidity**	Affect nutrient availability & organisms pH scale 4 - 6.9 (acid) 7 (neutral) 7.1 - 8.5 (alkaline) Soils become more acidic with cultivation
128.	**Effect of high soil acidity**	pH 5 Aluminum poisons the plant
129.	**Parts of the vine**	Roots - absorb water and nutrients, anchor vine, store carbohydrates Trunk/arms - transport water, store carbohydrates Shoots - support leaves Nodes - from where leaves, flowers and tendrils grow Buds - prompt, latent/dormant Leaves - photosynthesis, transpiration Petioles - leaf stalks (petiole analysis for nutrients) Flowers - reproduction, hermaphroditic, inflorescences Tendrils - "fingers" that hold on to trellis wires Berries - attract birds
130.	**Growth cycle of the vine**	Budburst - April/May (Sep/Oct) Shoot growth - May/Aug (Oct/Jan) Flowering and fruit set - Jun/Jul (Nov/Dec) Berry growth & veraison - Jul/Sep (Dec/Feb) Wood ripening - Sep/Nov (Feb/Apr) Berry ripening - Sep/Nov (Feb/May) Winter dormancy - Nov/Jan (May/Jul)
131.	**Veraison**	Berry skins change colour - translucent for white varities - red for black varieties
132.	**Most important stages in the growth cycle**	Floral initiation (depend on temp and sunlight) Budburst (affected by spring frosts) Flowering (temp, affected by rain) Fruit set (coulure = failure of berries to set) Shoot growth (in balance with yield) Berry ripening (sugar/physiological ripening)
133.	**Life cycle of the vine**	Yr 1-3 Trunk/Wood (Vegetable growth/drop fruit) Yr 3-4 1st Crop (good fruit to leave balance) Yr 7-20 Wood thicken (vigorous vine/high yield) Yr 20+ Yield decline (vielles vignes, alte Reben)
134.	**Criteria for vine selection**	Adaptation to the climate: cold, short growing season, drought etc Resistance to disease: phylloxera, nematodes, mildews, oidium, botrytis Adaptation to the soil conditions: lime, drought, acidity, salt (most important for rootstocks) Economic characteristics: high yield, high quality, suitablity for mechanisation
135.	**Hybridisation**	Interspecific - Vitis vinifera with Vitis riparia, Vitis labrusca and Vitis aestivalis - Concord, Black Hamburg, Clinton Reasons for hybridisation - Phylloxera & Downy Mildew (Plasmopara viticola) - winter cold resistance EU laws prohibits hybrids in QWPSR

136. **Crosses**

Intraspecific
- Alicante Bouschet = Aramon x Teinturier
- Muller-Thurgau = Riesling x Madeleine Royale
- Scheurebe, Kerner, Reichensteiner

137. **Mass selection (Selection Massale)**

Marking the best vines at harvest from which to take cuttings
Best performed during poor vintages

138. **Clonal selection**

Vines taken from one parent (genetically identical)

Criteria
- yield, fertility, berry size, sugar, acidity, colour, flavour, aroma, disease, drought, virus free, ease of grafting, cost

139. **Disadvantages of clonal selection**

Spread of disease
Limited to certain regions
Limited to certain styles
Overproduction
Reduction in vine genetic resources

140. **Genetic modification**

Transfer or modification of genes
Could help with disease
No GM currently in use

141. **Layering**

Canes are buried in the ground and then separated from the parent plant once they have established their own roots

Vitis berlandieri and rotundifolia
Vitis vinifera only layered in Phylloxera-free soils

142. **Cuttings**

Pieces of parent plant develop into new plants
Hardwood winter cuttings from canes (carbohydrates)
Cuttings 30-45 cm in length
Stored at 5 C prior to grafting
Heat treated at 50 C for 30 mins (pests, virus)

143. **Grafting**

Vinifera scion grafted onto American rootstock
Purpose
- Phylloxera, Nematodes
- soil conditions (lime)
- high or low vigour
- change varieties (top or head-grafting)

144. **Grafting methods**

Field grafting
Bench grafting (in nursery)
- Whip (by hand)
- Omega (by machine)
Top grafting
- chip-budding
- T-budding
- cleft-grafting

145. **Vitis vinifera**

Vitis vinifera sativa
- cultivated vine
- 5 to 10,000 wine-producing varieties
- hermaphroditic
Vitis vinifera silvestris
- wild European vines
- not usually hermaphrodite
- killed by phylloxera

146. **Vitis labrusca**

- NE US
- strongly flavoured, dark berries
- foxy aroma
- common parent in American hybrids, e.g. Concord
- not often used as parent for rootstock

147. **Vitis riparia**

- river banks and alluvial soil
- Central-eastern N America
- rootstock
- low in vigour and surface rooting
- encourage early ripening
- phylloxera resistance
- iron deficiency (chlorosis) in chalky soils

148. **Vitis rupestris**

- light soils in southern centre of US
- rootstock
- vigorous, deep rooting
- phylloxera resistance
- not very susceptible to chlorosis
- for poor soils with limited water availability

149. **Vitis berlandieri**

- chalky slopes in S US and Mexico
- vigorous, deep rooting
- high resistance to chlorosis
- often hybridised with riparia and rupestris
- lime-resistant rootstocks

150. **Reasons for using rootstocks**

Phylloxera vastatrix
- 1863 Europe
- 2/3 of vineyards destroyed

Nematodes
- Pratylenchus & Meloidogyne (feeding on roots)
- xiphinema index (viral diseases)

Lime (chlorosis)
- hybridisation of riparia and rupestris with berlandieri

Acidity (aluminium toxicity)
Salinity (disrupt water uptake and vine nutrition)
Drought stress (rupestris-based rootstocks)
Humid soils (riparia-based rootstocks)
Vigour control
- rupestris-based (high vigour)
- riparia-based (slow growth)
- low vigour rootstocks in high-density plantations
- high-vigour rootstocks in high-yielding, low-density vineyard
- vigourous rootstock for poor soils in dry conditions
- weak vigour rootstock for fertile soils

Encourage earlier ripening (cooler climates)

151. **Symptoms of phylloxera infestation**

Die of drought
Roots covered with insects (oval yellow-brown dots)
Nodosities (whitish or yellowish) near root tip
Tuberosities (swellings) on older roots
Pale green leaf galls

152. **Remedies for phylloxera**

1872 Laliman
- Grafting on phylloxera resistant rootstocks
- Vines on sandy soils
- Flooding vineyard for 40 days

153. **Riparia Glorie de Montpellier**

Vitis riparia
Vigour +
Humid, cool fertile soil
Low lime tolerance
Drought +
Phylloxera +++++
Nematodes +++
Suitable for production of quality wines
Sensitive to compact soils
Prefer moist soils

154. **Rupestris du Lot**

Vitis rupestris
Vigour +++++
Deep, poor, healthy soil
Low lime tolerance
Drought +++
Phylloxera ++++
Nematodes +++
High vigour Mediterranean rootstock
Sensitive to coulure and compact soils

155. **AXR1 (=ARG1)**

Vinifera x rupestris
Vigour ++++
Versatile soil
High lime tolerance
Drought +++
Phylloxera +
Nematodes ++
Easy to graft, yields high quality fruit with good yields, but limited tolerance to phylloxera

156. **3309 C (Couderc)**

Riparia x rupestris
Vigour +++
Cool, fertile, permeable soil
Low lime tolerance
Drought +
Phylloxera ++++
Nematodes ++++
Fruits well
France, Germany, Switzerland
Acid soils

157. **101-14 (Millardet et de Grasset)**

Riparia x rupestris
Vigour ++
Cool, fertile, damp soil
Low lime tolerance
Drought +
Phylloxera ++++
Nematodes +++
Suitable for production of quality wines

158. **Schwarzman**

Riparia x rupestris
Vigour ++
Deep, moist soil
Low lime tolerance
Drought +
Phylloxera ++++
Nematodes +++++
Ideal in areas with serious nematode problems

159.	**161-49C (Couderc)**	Riparia x berlandieri Vigour ++ Cool, fertile, permeable soil High lime tolerance Drought + Phylloxera ++++ Nematodes ++ France, Germany, Switzerland Good fruiting Good for acid soils
160.	**420A (Millardet et de Grasset)**	Riparia x berlandieri Vigour ++ Cool, deep, rich, permeable soil Medium lime tolerance Drought + Phylloxera +++++ Nematodes +++ Good for quality vineyards
161.	**5C (Teleki)**	Riparia x berlandieri Vigour +++ Wide range: chalky clay, compact Medium lime tolerance Drought + Phylloxera ++++ Nematodes ++++ Suitable for quality vineyards in northern regions Poor K uptake
162.	**5BB (Teleki Selection Kober)**	Riparia x berlandieri Vigour +++ Wide range: cold, fertile, permeable Medium lime tolerance Drought ++ Phylloxera ++++ Nematodes ++++ If fertile soil, avoid varieties sensitive to coulure Poor uptake of K and Mg
163.	**SO4 Selection Oppenheim**	Riparia x berlandieri Vigour +++ Fertile, humid, cold soil Medium lime tolerance Drought + Phylloxera ++++ Nematodes ++ Very fruitful Europe Poor uptake of K
164.	**125AA (Kober)**	Riparia x berlandieri Vigour ++++ Very wide range of soil Medium lime tolerance Drought +++ Phylloxera ++++ Nematodes +++ Not for varieties sensitive to coulure
165.	**99R (Richter)**	Berlandieri x rupestris Vigour +++++ Average fertility, deep, permeable soil Medium lime tolerance Drought +++ Phylloxera +++++ Nematodes ++++ Fruits well S France
166.	**110R (Richter)**	Berlandieri x rupestris Vigour +++++ Deep, poor clay-calcareous Medium lime tolerance Drought ++++ Phylloxera ++++ Nematodes +++ Good rootstock for dry regions Poor uptake of K and Manganese
167.	**140 RU (Ruggieri)**	Berlandieri x rupestris Vigour +++++ Poor, dry soil High lime tolerance Drought ++++ Phylloxera ++++ Nematodes +++ Suitable for Mediterranean countries
168.	**1103 P (Paulsen)**	Berlandieri x rupestris Vigour +++++ Poor, dry, average compactness Medium lime tolerance Drought ++++ Phylloxera ++++ Nematodes +++ Warm climate rootstock Saline resistant
169.	**Fercal**	Berlandieri x vinifera Vigour +++ Dry, shallow, calcareous soil Very high lime tolerance Drought ++++ Phylloxera +++ Nematodes +++ Mg deficiency if K applications are too great

170. **41B (Millardet et de Grasset)**

Berlandieri x vinifera
Vigour +++
Dry, calcareous soil
High lime tolerance
Drought +++
Phylloxera ++
Nematodes ++
Champagne and Charentes
Some susceptibility to phylloxera
Good fruiting
Good uptake of Mg

171. **333EM (Ecole de Montpellier)**

Berlandieri x vinifera
Vigour +++
Humid, compact soil
High lime tolerance
Drought ++++
Phylloxera ++++
Nematodes ++
Champagne, Charentes, Midi
Can cause coulure

172. **Dog Ridge**

Vitis Champini
Vigour +++++
Poor, light-textured soil
Low lime tolerance
Drought ++
Phylloxera ++
Nematodes +++++
For serious nematode problems
Lower quality potential than Schwarzman
Weak phylloxera tolerance

173. **Key environmental factors for site selection**

Water availability
Regional climate (temp & sunshine hour)
Soil type and quality
Access to the site
Availability of labour and resources
Proximity to market

174. **Site selection - water consideration**

Amount, timing, quality

High rainfall - rain shadows
Moderate to low rainfall - rivers or streams

175. **Site selection - heat consideration**

Sufficient, not excessive

Too cool - phenological, yield, ripening
Too hot - shading, uneven veraison, low sugar

176. **Site selection - sunlight consideration**

1250 hours required

Factors
- topography
- latitude
- season
- time of day
- cloud over
- slope
- trellis design
- row orientation
- canopy management

177. **Site selection - nutrients**

Macro- and micronutrients

Nutrient deficient soils
- sandy soil in high rainfall areas (K, Ca, S)
- shallow soils in low rainfall areas (N)

178. **Site selection - practical and commercial factors**

Access (cars, tractors, electricity, water)
Availability of Labour
Proximity to markets
Vineyards in the vicinity

179. **Selecting the right variety**

8000 grapes, 1000 important
Clonal differences

Critieria
- genetic characteristics
- performance in site climate (sugar, acid, pigments, tannin, fruit favors)
- winemaking influence
- fashion
- vegetative & reproductive cycles
- yields
- disease
- legislation

180. **Vineyard design - planting density**

1 hectare (100m x 100m) : 2.47 acres
rows x # vines/row
high density not = high quality
balance between root and canopy
- vigour
- planting density
- soil fertility
- training
- poor soil -> high density
- low water -> low density
- fertile soil -> low density
row alleys not < heights of row canopy
15 shoots per metre
wider alleys -> greater plant distance

181. **Vineyard design - row orientation**

Influenced by
- shape of the field
- direction of the slope
- prevailing wind

Cool climates: N-S direction
Sauvignon Blanc: E-W direction (pyrazine)

182. **What is a trellis?**

A physical structure, consisting of posts and wines that largely supports the grapevine framework (canes, shoots, foliage)

Simple: low vigor, low potential site
Complex: high vigor sites, disease control

183. **What factors affect the choice of a trellis system?**

Legislation
Geographical features of site
- topography
- wind
- rainfall
- temperature
- frost risk (higher trellis at bottom of slope)
- soil fertility

Effectiveness of light interception
Cost/time (establishment and maintenance)
Mechanical potential
Popularity and attractiveness

184. **Types of trellis systems**

Untrellised
Staked vines
Single wire
Two-wire, vertical
Vertical shoot positioning (VSP)
Vertical, divided
Multi-wire, horizontal
Geneva double curtain trellis (GDC)
U-shaped or lyre
Pergod/tendone

185. **Untrellised**

S Europe

bush (trunk trained short)
no trellis
spur-pruned (bush vines or gobelets)
cane-pruned (basket; Santorini, Greece)

Pros: low cost
Cons: low yields, disease, manual

186. **Staked vines**

Cote Rotie, S France, Spain, Portugal, Italy, California, S Africa

Post to support vine
Trained higher than bush
Trained to form a crown (head) 20-30 cm above the ground
Spur-pruned without a crown

Pros: air circulation -> less disease
Cons: low yield, not for high vigor sites

187. **Single wire**

Cordon trained and spur pruned
Head trained and cane pruned

Pros: continuous foliage, inexpensive
Cons: new shoots hang down -> sunburn

188. **Two-wire, vertical**

California in mid-1980s

Most basic form of multi-wired trellis system
Single fruiting wire, single foliage wire above

Pros: mechanical pruning and harvesting

189. **Vertical shoot position (VSP)**

France, Germany, cooler regions of Austalia and NZ
Places with high risk of fungal diseases

Non-divided canopy
Movable foliage wires
Cane-pruned (guyot)
Spur-pruned (unilateral/bilateral cordons)

Pros: mechanical operations & harvest
Cons: high shoot density, not for high vigor varieties and high potential sites

190. **Vertical, divided**

Scott-Henry (cane-pruned)
Smart-Dyson or Ballerina (cordon-trained)

2 fruiting zones (1.0 m and 1.15 m)
higher wire: upwards
lower wire: downwards
2 m tall, row spacing > 2 m

Pros: 60% more canopy; halved shoot density; de-vigorating effect (downward shoots)
Cons: high establishment costs; expertise

191. **Multi-wired, horizontal**

Geneva Double Curtain
U-shaped or lyre
Overhead pergola system

192. **Geneva double curtain trellis (GDC)**

Australia, California, parts of Italy

Improve yield and fruit composition in vigorous soil
Shoot de-vigorating effect (downward shoots)
Higher yields of better quality grapes
Spur pruned, harvested by machine
Pros: 50% yield increase over VSP
Cons: high establishment costs, expertise

193. **U-shaped or lyre trellis**

France, California, NZ, cool regions of Australia, Chile and Uruguay
Medium to high vigor sites

Improved yield and grape quality
Machine operations
Cons: high cost of construction/maintenance

194. **Pergola/tendone trellis**

Chile, Agentina, Italy
Table grapes
2m high trunks
Cane or spur pruned
Cons: high cost of construction/maintenance; not for high potential sites; shading problems (powdery mildew, botrytis)

195. **Site preparation and planting**

Yr 1 - Summer
- remove existing vegetation
- (optional) windbreaks, leveling, terracing, sub-soiling, drainage, soil disinfection

Yr 1 - Autumn
- corrective fertilisation
- deep ploughing

Yr 2 - Spring
- deep cultivation
- tracing out the plantation
- planting

196. **How to improve drainage?**

Manure
Ditches
Drainage pipes
Mole draining
Sub-soiling

197. **When is terracing needed?**

Slope over 20 degrees

198. **Plastic mulching**

Pros
- young vines suffer less drought
- less weed competition
- better soil structure
- higher soil temp for microbial activity

Cons
- cost & labour
- frost risk
- weeds
- slugs, mice, snakes
- removal & disposal
- superficial rooting

Alternative
- tree guards (grow tubes/polythene sleeves)

199. **Care of young plants**

Watering
Weed control
Rabbits (plastic netted sleeves)
Slugs and snails (slug pellets)
Wind protection (temporary windbreaks)
Disease (powdery mildew)
Tying up and summer pruning
Replacing unsuccessful vines

200. **Why pruning and training?**

Un-pruned vines
- irregular yields
- high-acid, low-sugar berries

Pruning and training to increase yield/quality
- balance between fruit and leaf
- ideal canopy (15 shoots/m; 1-1.5 leave thick)
- shoot about pencil thick, 12-15 nodes long
- appropriate crop size
- trellis to capture max sunlight
- avoid leave bunching/disease risk
- uniform bunch ripening
- allow mechanical spraying and harvesting
- young vines pruned lightly with flower removed
- older vines pruned lightly to raise crop

201. **Vine's vigor**

Weight of wood produced in a year

202. **How many buds to leave on vine at winter pruning (the charge)?**

Count # of ideal shoots in previous season
Remove and weight canes, then divide by 30-40
Young vines < 8 yr = more buds
Old vines 5-15% more buds

203. **What is canopy management?**

Organisation of the shoots, leaves and fruit of the grapevine to maximise the quality of the microclimate of the leaves and fruit to improve quality and yield and to minimise disease risk.

Where is it importance?
- cool-climate regions
- New World: high vine vigor in fertile soils

204. **Main aims of canopy management**

Max light interception
- large canopy surface
- early development of canopy in spring
- avoid inter-row shading (1:1 height:alley width)

Min canopy shading
- shaded leaves use, rather than produce energy
- Dr Richard Smart: vegetative cycle

Uniform microclimate for fruit

Balance between fruit and leaf

Min disease

Mechanization (pruning, pesticide, harvesting)

205. **Vegetative Cycle vs Balanced Cycle**

Vegetative cycle
- sheds depresses berry growth
- fruit weight is reduced
- shoot growth stimulated -> imbalance
- canopy gets thicker -> more shading

Balanced cycle
- light stimulates berry growth
- fruit weight is increased
- shoot growth depressed -> balance
- canopy decreases -> min shading

206. **Steps in canopy management**

Diagnosis of canopy
- leaf layer #
- % exposed grape clusters
- leaf size/colour
- # of lateral shoots
- % actively growing shoot tips

Site assessment
- soil profile
- water supply
- soil fertility

207. **How does site potential affect canopy management?**

High
- >1m deep, fertile, good water, high nutrient
- low density (< 3000 plants/ha)
- complex trellis (Ruakura twin two tier, GDC)

Medium
- 0.5-1m deep, adequate water, avg fertility
- avg density (3000-5000)
- lyre, Scott-Henry, large VSP

Low
- < 0.5m deep, poor water, low fertility
- high-density (>5000)
- VSP, single or double guyot

208. **How does vine vigours affect canopy management?**

Low vigour
- drought stress (irrigation where legal)
- low soil fertility (fertilisation)
- disease (diagnosis and treatment)

High vigour (more difficult to control)
- low vigour rootstocks
- water stress
- cover cropping
- high density planting (low potential sites)
- removing alternatie vines
- root pruning
- complex trellis
- pinching (shoot removal) -> lateral shoots
- shoot positioning, trimming, leaf striping, crop thinning or green harvesting

209.	**Winter pruning (2nd most expensive process)**	Minimal (zero) pruning - table grapes Replacement cane (guyot) - cane-pruned system with 1 or more spurs - single guyot: 1 spur/1 cane - double guyot: 2 spurs/2 canes - determined by vigour or laws - limit carbonhydrate reserves to control vigour - skills required, manual - buds at end of canes break first, more vigorous - canes tied down in an arch (pendelbogen) Condon/spur pruning - "head pruned" or bush vines or gobelet - single cordon with vertically positioned shoots - Te Kauwhata two tier - Cordon de Royal, Sylvoz, Lenz-Moser, GDC - easier to prune, pre-pruned by machine - more vigorous
210.	**Other factors when pruning**	Affect timing of bud break - early: spring frost - late: ripening Pruning wounds - over 30 mm will not heal properly Dispose pruning wood Disease - botrytis - powdery mildew - phomopsis - virus - fungus/eutypa
211.	**Summer Training**	Trimming (July/Feb) - hand or machine - control shoot growth - reduce canopy - aid ripening Shoot positioning - shoot removal - bud-rubbing (removal of unwanted shoots) - tucking in (shoots in between foliage wires) - 15 shoots/m of trellis Leaf stripping - around fruit zone - between veraison and harvest Green harvesting - removal of bunches - alter leaf to fruit ratio - done at veraison
212.	**Why soil management?**	To provide an ideal environment for root development
213.	**Ideal soil condition**	Loam texture Stable crumb structure Sufficient water Good drainage and aeration High microbial/macrobial activity pH 6.0 - 7.5 Sufficient nutrients Sufficient depth and volume
214.	**Vineyard nutrition**	Losses - uptake by vine - removal of crop - leaching - erosion - rain Gain - return of leaves and pruning waste - fixation of nitrogen from the air
215.	**What are macronutrients?**	N, K, P, Ca, Mg, S
216.	**What are micronutrients?**	Fe, Mn, Mo, Cu, Zn, B

217.	**What are the effects of nutrient deficiencies?**	Vine health Growth Yield Quality Chlorosis - lack of Fe, Cu, Mg, S Affects shape and color of leaves
218.	**Soil analysis**	Before planting Every 2-3 years Determine amt of fertiliser to be added
219.	**Petiole and leaf analysis**	Confirm visual symptoms Assess effectiveness - fertilizers - irrigation - weed control - does not tell how much fertilizer to add
220.	**Use of fertilizers**	Correct soil deficiencies Lower acidity (raise pH above 6)
221.	**What nutrients to add?**	Spring: N Autumn: P & K
222.	**Organic fertilizers**	Fresh or composted plant or animal material Cheap High in humus Good for soil structure and water retention Encourage soil organisms & aeration Slow-release Bulk & expensive to transport and spread Main formats - farmyard manure - slurry or cereal straws - green manure - foliar fertilizers Cover crop - white mustard - prevent water run off & erosion - weed control, bind nutrients Leguminous crop - vetch (nitrogen)
223.	**Disadvantages of weeds**	Compete for water & nutrients Increase frost risk Host for pests and diseases
224.	**Advantages of weeds**	Prevent soil erosion Prevent nitrate leaching Encourage biodiversity Reduce excess vine vigour Improve soil structure Warn of disease, nutrient deficiencies, etc
225.	**Weed control methods**	Cultivation Ground cover Herbicides Mulching Animals Flame weeding
226.	**Cultivation**	Autumn: ridge up Spring: de-ridge Summer: 2 times Never when wet Best when roots are active Pros - effective - efficient Cons - breakdown soil structure - uneconomic
227.	**Ground cover**	Ideal cover crop is quick to establish Natural vegetation difficult to manage and harbors pests Pros - good for soil structure - control vine vigor - encourage deep rooting - prevent erosion Cons - less vine vigor - humidity - spring frosts

228. **Herbicides**	No-till cultivation Pre-emergence herbicides - poorly soluble/trapped in soil - before budbreak Contact herbicides - wilters/knockdown - broken down quickly - after bud burst Systemic herbicides - absorbed by leaves - kill entire plant - after leaf fall Pros - less manpower - effective - reduce spring frost Cons - expensive - toxic - decrease micro-organisms - environmental concerns
229. **Mulching**	Suppresses weeds Prevent light from reaching weed Pros - conserve water - increase microbial activity - improve soil structure - reduce erosion Cons - expensive - superficial rooting - frost risks - pest infestation
230. **Choice of irrigation**	Soil texture Slope Cost Labor Automation Frost protection Water supply Salinity Water quality
231. **Irrigation systems**	Flood Sprinkler Under-canopy Drip Regulated deficit irrigation (RDI) Partial rootzone drying (PRD)
232. **Flood irrigation**	Lots of water required Desert areas for bulk wine production Agentina
233. **Fixed and traveling sprinklers**	Effective for large vineyards Cheap to install Frost control Induce noble rot Cons - waste water - fungal disease - labour intensive (traveling sprinklers)
234. **Under-canopy systems**	Good water coverage Cons - high level of management - blockages
235. **Drip systems**	Better control of water supply Save water Cons - expensive - constant monitoring
236. **Regulated deficit irrigation (RDI)**	Use water stress to control vegetative growth Cons - high management skills - very careful monitoring of soil content - not for hot regions
237. **Partial rootzone drying (PRD)**	Control vine vigour Maintain wine quality Cons - high management skills - accurate monitoring of soil water content
238. **Viruses**	Genetic material surrounded by a protein coat - fanleaf virus - leafroll - corky bark - stem pitting
239. **Phytoplasmas**	Small bacteria without cell walls - flavescence doree - grapevine yellows
240. **Bacteria**	cell wall, but no chlorophyll - crown-gall - bacterial vine necrosis - pierce's disease

241.	**Fungi**	no carbohydrate cell wall, no chlorophyll - powdery mildew - downy mildew - botrytis - phomopsis - black rot - eutypa
242.	**Nematodes**	un-segmented parasitic roundworms - dagger nematode - root-knot nematode
243.	**Arthropods**	Segmented invertebrates with heads - spider mites - grapevine moths - phylloxera - leafhoppers - cicadelles
244.	**Vertebrates**	Animals with backbones - birds - rabbits - deer - foxes
245.	**Weed**	Plant that shouldn't be in the vineyard
246.	**Pest management philosophies**	prophylactic or prescriptive reasoned pest control (lutte raisonee) integrated pest management (IPM)
247.	**Powdery mildew**	Fungi - Oidium tuckerii or Unicula necator Attacks green shoots & leaves Leaves: dull grey patches, cobwebs patches Musty smelling canopy Over winters in dormant buds Spread by wind 21 - 25 C, rain not required - warm, cloudy summers Killed by sunlight or temperature Prevention - canopy management - sulphur spray (18 - 35 C) - DNA Methytransferase Inhibitors (DMIs)
248.	**Downy mildew**	Fungi - Plasmopara viticola Peronospera (DP) Attacks green shoots & leaves Leaves: yellow oil spots, white downy patches Lives in the tissue (not on surface) Flowers dry up and drop off Berries go grey Needs rainfall/water and warm temp (18 C) Prevention - canopy management - copper salts (preentative) - organic and systemic pesticides
249.	**Grey Rot**	Fungi - Botrytis Cinerea High humidity and warm temp Enter vine through wound Attacks leaves & fruit Brown then black patches Berry infections most serious Affect tight clusters from middle outward Preventative measures are the best - fungicides - spray at flowering, berry set, veraison
250.	**Noble Rot**	Fungi - Botrytis Cinerea Humid mornings, warm dry afternoons Proximity to a body of water Berries go lilac and shrivel Rain can turn noble rot to grey rot Thin skinned grapes - Semillon (Sauternes) - Chenin Blanc (Loire) - Sauvignon Blanc - Riesling (Germany) - Furmint (Hungary)
251.	**Eutypa dieback**	Dead Arm or Dying Arm Fungi: Eutypa lata Pruning wounds Mild temp and moisture Kill conducting tissue Stunted shoots, yellow cupped leaves Healthy water shoot can replace arm Prevention - vineyard hygiene - removal of infected wood

252. **Phomopsis**

Fungi: Phomopsis viticola
Basal buds lose viability
Infected canes whiten and snap off easily
Leaf: small dark spots after rainfall
Overwinters in dormant buds
Introduced by infected planting material
Damp vineyards, rainy, cold springs

Prevention
- good plant material
- fungicides
- sodium arsenite (legal issues)

253. **Mites**

Minute arachnids (0.2-0.5 mm)
White to dark red in colour
Feed on green tissues, leaves
Affects photosynthesis
Over winter in dormant buds

Prevention
- sulphur sprays
- predatory mites
- miticides

254. **Grape moths**

Flying insects
Damage grape vines in laval stage
Europe
- pyrale, cochylis, European grape moth, eulia
California
- Orange Tatrix
Australia and NZ
- light brown apple moth
Feed on leaves and bunches

Prevention
- insecticides
- natural enemies (spiders, wasps, shield bug)

255. **Pierce's disease**

Bacteria: Xylella Fastidiosa
Spread by glassy winged sharpshooter
Leaves are stuned and slow
Stunted shoots
Death 1-5 years
No cure

256. **Fanleaf virus**

Virus
Shoot growth is malformed
Leaves look like fans, with yellow veins
Vine fails to fruit, loss of 80%
Spread by infected planting material, nematode
No cure

257. **Leafrool virus**

Virus
Most wildspread disease
Leaves turn bright red (black grapes) or yellow (white grapes) in Autumn
Yields reduced by 50%
Berry sugar decreases by 30%
Delay maturity
Spread by infected cuttings
Mealybugs as vector
No cure

258. **Birds**

Vineyards near forests
Sarling, blackbirds, sparrows
Some peck a hole, others take the fruit
Holes lead to infection

Prevention
- scarers (bangers, reflectors, scarecrows)
- netting (over the row, fruit zone)

259. **Hazards**

Winter freeze and frost
Wind
Hail
Drought
Excess rain

260. **Winter freeze**

Canada, Washington, China

Prevention
- multiple trunks
- hilling up

261. **Spring frost**

Site selection
High wire training
Delayed winter pruning
Soil with good heat conductivity
Thin polymer coat
Fans/windmills
Helicopters
Burners
Overhead sprinklers

262. **Wind**

Loss of yield and quality

Wind breaks
- artificial and natural
- within 10 times the height

263. **Hail**

Burgundy, Mendoza, Piedmont
Irregular pathway
Rip and strip leaves & bunches

Prevention
- explosive rockets
- towers charged with static electricity
- netting

264. **Drought**

Australia

Irrigation

265.	**Excess rain**	Vegetative growth Fungal diseases Berry dilution & splitting Good soil drainage
266.	**Preventative Methods**	Conventional agrochemicals Integrated viticulture (lutte raisonee) Organic viticulture Biodynamic viticulture
267.	**Conventional agrochemicals**	New agrochemicals - fungicides, insecticides, pesticides, etc. - fertilisers - used after 1950s - withholding period - maximam residual levels (MRL) Conventional - copper and sulphur - manure
268.	**Integrated viticulture (lutte raisonee)**	International Organisation for Biological Control (IOBC) Integrated Pest Management (IPM) France, Switzerland, S Germany Reduce degration Certification Economic viability - reduce chemical inputs - green cover - mowing of cover crop - rootstocks - canopy management - avoid water pollution - natural predatory pests - monitor
269.	**Organic viticulture**	Agentina, ustralia, Chile, Germany, France, Austria, California, Italy, Spain Coexist with natural systems Enhance biological cycles IFOAM guidelines - record all inputs - 3-year plan for a sustainable system Optimum soil structure & fertility - regular input of organic residues - micro-organisms - cover crops - appropriate cultivation - composting - suppress weed, not eliminate - no synthetic herbicides or pesticides - Bordeaux mixture & sulphur allowed
270.	**Biodynamic viticulture**	Rudolph Steiner Highly spiritual and intangible Holistic approach Cosmic relationship Life forces Objectives - healthy living soil - balanced vines - harmony with nature Practices governed by positions of planets Biodynamic preparations - horn manure (500) - horn silica (501) - herbal & plant preparations (502-507)
271.	**Grape berry - anatomy**	Skin (epidermis) - thin waxy layer (cuticle) Pulp - vacuoles (contains juice, sweet when ripe) - peripheral pulp (pigments, tannins, flavor) - intermediate pulp (low tannins & flavor) - central pulp (surrounds the seeds) Seeds - embryo and albumen - high level of tannins
272.	**Grape berry - constituents**	Water (80%) Sugars and other carbohydrates (20%) - glucose & fructose) - pectins (high in aromatic grapes) - broken down by pectolytic enzymes Acids (1%) - tartaric & malic - citric, ascorbic, acetic Phenolic compounds (0.1%) - colour, texture, astringency, bitterness - smaller phenolics (catechins, epicatechins) - anthocyanins (peripheral pulp) - tannins - favor compounds Mineral salts (K, Ca)

273. **What are the factors affecting the chemical composition of grapes?**

Grape variety or cultivar
Environment (terror)
Viticulture
Season/weather

274. **Ripening process - 4 stages**

Herbaceous phase (vegetative period)
- formation of berry till version
- small, hard and green berries
- acidic taste

Veraison
- a few days
- beginning of berry ripening
- change color
- berry stops photosynthesizing

Maturation (accumulation phase)
- 40-60 days
- grapes swell
- sugar increases, acidity decreases
- berry gains fruity flavours
- softening of berry
- rapid increase in glucose and fructose
- increase in phenolics

Sur-maturation
- over-ripe
- fruit shrivels
- sweet wines