1 gm of fat power =	8 gm of carbohydrates
Alkaloids	Common in certain plants groups including buttercups and asters
Alkaloids	Contain nitrogen, more than 20,000 different kinds identified including: Cocaine, Nicotine, Caffeine, Strychnine, and Morphine
Alkaloids	While most are deterrents and cause temporary illnesses, some very severely affect animals - some act like military nerve gases affecting the central nervous system
Alkaloids	Nasty when eaten; symptoms include: irritations of the mouth, salivation, severe gastroenteritis, and diarrhea
Allen's Rule	Short extremities are better
Animal Physical Defence - Body Hair (Guard Hairs) modified into quills	Porcupine
Animal Physical Defence - Long Body Hairs	Many caterpillars - Gypsy moth, woolly bear
Animal Physical Defence - Silkwebs	Eastern tent caterpillar, fall webworm
Animal Physical Defence (Body Armour) - Hard Exoskeleton	Many beetles, millipedes
Animal Physical Defence (Body Armour) - Hard shells formed from calcium	Snails, clams
Animal Physical Defence (Body Armour) - Shell formed from internal skeleton	Turtles (Blanding's turtles can partially close its shell)
Anti-Digestive Chemicals	Protenaise inhibitors - Affect digestion by blocking the action of protenaise, the enzyme that digests proteins animals
Anti-Digestive Chemicals - Protenaise Inhibitors	Not always present, sometimes produced when under attack
Anti-Juvenile Hormone	Stops the juvenile hormone production too soon and is not ready to reproduce
Anti-Juvenile Hormone	Yew has this hormone
Antifreeze =	Glycerol and Sorbitol = Cryoprotectants
Astrigent	Taste dry
Background Matching	Having the same general patterns and colours as the immediate environment
Background Matching & Disruptive Patterns	Only work if the animal remains completely still (cryptic)
Background Matching Examples	Gray Tree Frog (changes colour), Snowshoe Hare (changes colour seasonally), long-tailed and short-tailed weasels
Background Matching Examples in Grasslands	Sparrows - Savannah Sparrow
Background Matching Examples in Marshes	American Bittern
Batesian Mimicry	When a harmful model has some unpleasant feature (such as bad taste or a sting) and there is a harmless mimic that looks like it
Batesian Mimicry	Monarch Butterflies - Viceroy Wasps - Hover Flies
Bats	Needs the temperature to remain near freezing: in caves, rock crevices, attics, mine shafts, etc. - some huddling occurs
Behaviour to Cold - Choose warm sites for sleeping or roosting	Turn up the heat by shivering: some birds generate more heat by increasing the muscle activity, this happens at night or during cold stretches
Behaviour to Cold - Choose warm sites for sleeping or roosting	A few birds turn down the heat and enter a deep seep called torpor
Behaviour to Cold - Choose warm sites for sleeping or roosting	Share body warmth - Huddle Voles, Chickadees, and Bluebirds
Behaviour to Cold - Choose warm sites for sleeping or roosting	Cavities in trees (hole in tree)

31. **Behaviour to Cold - Choose warm sites for sleeping or roosting**	Conifer branches covered in snow - less wind, traps body heat
32. **Behaviour to Cold - Choose warm sites for sleeping or roosting**	Use the snow - Ruffed Grouse
33. **Behaviour to Cold - Choose warm sites for sleeping or roosting**	Use a den - Beavers build lodges and so do Muskrats
34. **Behaviour to Cold - Choose warm sites for sleeping or roosting**	Small mammals: under snow in subnivean space (only a few degrees below zero, while it might be -40 above the snow)
35. **Behaviour to Cold - Choose warm sites for sleeping or roosting (Turn down heat and enter deep sleep) Examples**	Black-Capped Chickadees (let internal body temperature fall to 12 degrees - short term - usually only overnight - if temperature falls too low, pectoral muscles kick in, shiver, raise temperature (like a thermostat))
36. **Behaviour to Cold - Choose warm sites for sleeping or roosting (Turn up heat by shivering) Examples**	Breast muscle huge - for flight, shivers to generate heat
37. **Behaviour to Cold - Choose warm sites for sleeping or roosting Examples**	Moose, and Hares - Lay under conifer branches that are snow covered - less wind under conifers, branches trap heat
38. **Behaviour to Cold - Choose warm sites for sleeping or roosting Examples**	Chickadees, Woodpeckers (stay inside cavities at night, small Owls (go inside cavities)
39. **Behaviour to Cold - Thermoregulate**	Back in warm site, out of the wind, to absorb solar energy
40. **Behaviour to Cold - Thermoregulate Examples**	Many birds, foxes, and other mammals
41. **Behaviour to Cold - Warm Extremities**	By tucking them under feathers; extremity touches skin, feathers keep warm
42. **Behaviour to Cold - Warm Extremities Examples**	Ducks and Swans
43. **Behaviour to Cold - When sleeping**	Reduce surface area
44. **Behaviour to Cold - When sleeping Examples**	Fox and wolves curl into a ball and put tail over nose , birds tuck head under wing
45. **Behavioural Freeze Avoidance**	Seek a site where temperatures are not below zero (Ectotherms go dormant below frost line)
46. **Behavioural Freeze Avoidance Examples**	Toads and Salamanders - Dig down below the frost line, and, Turtles and most Frogs (Bullfrogs) - go to the bottom of ponds where it does not freeze - here their metabolism slows down, they breathe through skin
47. **Behavioural Freeze Avoidance Examples**	Snakes go underground in cracks, etc., below the frost line = place where snakes are dormant
48. **Being a warmer colour**	White is warmer due to lack of pigmentation, hollow pockets that trap air
49. **Being a warmer colour Examples**	Polar bear, arctic fox, ptarmigan
50. **Below the frost line, place where snakes are dormant =**	Hibernaculum
51. **Bergmann's Rule**	Tend to find larger or rounder animals farther north
52. **Bicolouration**	Having a two-toned body, usually dark above and light below, often seen on animals that live near the surface of ponds
53. **Bicolouration**	Allows for background matching from two directions
54. **Bicolouration Examples**	Water Boatmen
55. **Bicolouration Examples**	Backswimmers (light above and dark below - swim upside down)
56. **Birds that flap continuously are...**	Ducks, Geese, Sandpipers, Hummingbirds
57. **Birds that migrate by both day and night - long distance migrants EXAMPLES**	Sandpipers
58. **Birds that migrate by day EXAMPLES**	Blue Jays, Hawks, Hummingbirds, Blackbirds, Swallows
59. **Birds that migrate by night**	Songbirds (travel at this time because - calmer, cooler, safer)

60.	**Bluffing**	Exaggerate size
61.	**Bluffing Examples**	American Toad, Hog-Nosed Snake
62.	**Bluffing Examples**	Swallowtail caterpillars have osmetaria that looks like a snake's tongue (mimicry)
63.	**Bodyguards**	Some animals enlist the help of more powerful animals
64.	**Bodyguards Examples**	Carpenter Ants - Defend aphids and other types of sucking bugs (such as treehoppers) WHY? They are paid for their services with food in the form of honeydew
65.	**Bracken and Rock Polypody**	A study found that 25 mg of ecdysone was in 2.5 grams of a fern root, the same amount was found in no less than 500 kg of insects
66.	**Calcium Oxalate**	Is caustic - has a corrosive taste
67.	**Calcium Oxalate Crystals**	In leaves of arum plants
68.	**Calcium Oxalate Crystals Examples**	Skunk cabbage and jack-in-the-pulpit
69.	**Camouflage**	Colours and patterns that allow animals to blend into the background
70.	**Cellulose, Pectin, And Hemicellulose**	(cell wall is composed of these) - gluey cement with "rods," together, these elements give rigidity to cell walls - BENEFIT: Hard to digest even for insects; omnivores and carnivores digest little, if at all
71.	**Chemical Defences**	On osmetaria of swallowtail butterflies
72.	**Chemical Defences**	Can be maufactured by the animal - Ladybugs makes alkaloids
73.	**Chemical Defences**	Are found and released by a variety of body parts - Milk weed beetle has poison in the body and are brightly coloured
74.	**Chemical Defences**	Can be released through the anus - Bombardier Beetle (spray cloud of hot quinone gas - that is produced when hydrogen peroxide is mixed with hydeoquinones and enzymes)
75.	**Chemical Defences - Injected by stingers**	wasps, bees
76.	**Chemical Defences - Legs**	Blister Beetle (terpenoid cantharidin) - use a chemical defence that oozes out of their leg joints (cantharidin)
77.	**Chemical Defences - Mouth**	Grasshoppers and Sawflay Larvae - release terpenoids from their mouths
78.	**Chemical Defences - Sequestered from animals**	Fireflies - Photuris females eat males of photinus species to sequester sterodial toxins
79.	**Chemical Defences - Sequestered from plants**	Monarch Butterfly Caterpillar - eats milkweed leaves containing cardiac glycosides (which are terpenoids) and stores in body
80.	**Chemical Defences - Skin**	Red Eft (Salamander/Samandarin) - Has poison in skin, American Toad (Bufotalin)
81.	**Chemical Defences are Sequestered**	Acquired in diet and then stored in the body
82.	**Constituitive**	Always present
83.	**Countershading**	Having a dark upper surfaces that shades a pale lower surface that when viewed from the side, this makes an animal appear "flat" and not three-dimensional
84.	**Countershading**	also known as Self-Shadow Concealment
85.	**Countershading Examples**	White-tailed deer, sandpipers, many bird including some hawks
86.	**Crypsis**	The art of concealment or remaining hidden: camouflage combined with motionless behaviour
87.	**Deflection Patterns**	Another name for distraction patterns that also serve this function
88.	**Different types of flight use by different birds:**	Flapping
89.	**Digestibility Reducer that are Not Structural**	Tannis, Calcium Oxalate Crystals, Anti-Digestive Chemical
90.	**Digestibility Reducers**	When eaten, makes it hard for the animal to digest the plant, most have a dual-purpose (structural and defensive)
91.	**Digestibility Reducers that are Structural Elements**	Cellulose, Pectin and Hemicellulose, Lignin, Silica
92.	**Digestibility Reducers that are Structural Elements**	Plant tissue have cells with stiff walls that can be thought of as Reinforced Concrete - cement with steel rods stuck in for support
93.	**Disruptive Patterns**	Patterns that break up the general form of an animal making it hard to see

94.	**Disruptive Patterns Examples**	Neck stripe - Canada Goose
95.	**Disruptive Patterns Examples**	Stripes and lines - Eastern Chipmunk's back and face
96.	**Disruptive Patterns Examples**	Breastbands - Killdeer
97.	**Disruptive Patterns Examples**	Necklace - Common Loon's neck
98.	**Disruptive Patterns Examples**	Eyelines and Eyestripes - Songbirds
99.	**Distraction Patterns**	Patterns that serve to distract or deflect a predators attention to a non-vital body part (often but not always startle patterns)
100.	**Distraction Patterns**	Permanent eyespots (never hidden) can be used to fool a predator into thinking the animal is bigger than it really is - Eye Elater (Beetle) and Tiger Swallowtail Caterpillar
101.	**Distraction Patterns**	Some butterflies have eyespots and fake antennae on hind wings that serve to distract or deflect - Tailed-blue butterfly, Swallowtail butterfly and Five-link Skink (has blue tail)
102.	**Distraction Patterns - Disguise through behaviour**	Some animals add bits of environment to body to disguise: masquerade artists - Leaf rollers, caddisfly larvae, and sumac gall aphids
103.	**Dormancy at any life stage - Adults**	Angle-Winged Butterflies (that is why we see them very early in the spring), Lady Beetles (That is why we seem them in houses in the fall)
104.	**Dormancy at any life stage - Eggs**	Underwing Moths, Praying Mantids (eggs cases are called ootheca)
105.	**Dormancy at any life stage - Larva**	Woolly Bears Caterpillars
106.	**Dormancy at any life stage - Pupal Stage**	Many moths and butterflies including Silk Moths and Sphinx Moths
107.	**Ecotherms Examples**	Frogs, Snakes, Turtles, Salamanders (ALL are herps), Insects and Spiders
108.	**Ectotherms**	Largely controlled by the temperature of the external environment
109.	**Ectotherms - How do they avoid freezing?**	They escape freezing temperatures by avoiding them by: Behavioural Freeze Avoidance, go Dormant, and Supercooling
110.	**Ectotherms - How do they avoid freezing?**	Most insects and other invertebrates also go dormant in areas where it is below zero - they produce ANTIFREEZE
111.	**Ectotherms - How do they avoid freezing?**	Most HERPS (reptiles & amphibians) become inactive
112.	**Ectotherms - How do they avoid freezing?**	Some insect grubs on larval stages overwinter in galls - enlarged structures on plants that contain animals (Goldenrod Gall Fly - Larvae are freeze-tolerant in Galls. HOW? Cryopretectants inside the cells, ice nuleating sites between mean)
113.	**Ectotherms - How do they avoid freezing? - Chorus Frog, Wood Frog, Spring Peeper, Gray Tree Frog**	Stay near soil's surface, freeze, allow ice to form inside body - but ice forms between body cells, not inside the cells
114.	**Endortherms that remain active stay warm by**	Increasing body insulation to trap air and body heat, putting on an extra layer inside the body, being a warmer colour, having a better body shape for retaining heat, reducing the surface area of body losing heat, and reducing the amount of heat being lost through extremities
115.	**Endotherms**	Generate heat internally
116.	**Endotherms Examples**	Birds and Mammals
117.	**Fat is**	a highly efficient fuel
118.	**Flapping**	Burns up energy
119.	**Flapping**	Is a powered flight - use breast muscles, some birds flap continuously
120.	**Flocking**	Increases vigilance giving flock members more time to feed, plus there's safety in numbers
121.	**Flocking**	More eyes to watch for danger, better odds of not being eaten
122.	**Flocking**	Animals travel in groups for safety
123.	**Flocking Examples**	White-tailed deer and cottontails - have white tails of "flags" they raise when they are running away, this may signal predators that they have been seen
124.	**Flocking might**	Confuse predators and make it safer for each bird
125.	**For birds shivering is an important means of**	Thermogenisis

126.	**For many animals, lowering of body temperature below zero is...**	fatal
127.	**For small birds, fat is...**	Deposited in a mere 2 to 4 days of foraging
128.	**Fuel instead of carbohydrates for travelling because**	Carbohydrates = more weight to carry, Fat = no water needed to metabolize, and Fat is stored easily
129.	**Fuel is**	fat
130.	**Glandular Hairs**	One type - Separately store phenols and enzymes, when animal brushes on them they break open, contents mix like epoxy, create glue-like ooze that hardens, also releases repulsive chemicals
131.	**Gloger's Rule**	As you go farther north, animals tend to be paler
132.	**Group Defence in Social Insects Examples**	Yellow-Jacket Wasps send out attack pheromones to summon the troops
133.	**Having a better body shape for retaining heat**	Smaller extremities in north
134.	**Having a better body shape for retaining heat Examples**	Lemming tails, caribous, arctic fox ears
135.	**Hawks use of rising air columns is called**	Thermalling or Thermal Hopping
136.	**Hormones**	Each hormone must be present in the right amounts at the right time for normal development, too much or too little or either causes severe problems
137.	**Hormones**	Some plants produce hormones that are exactly the same as ones in animals
138.	**How do animals allow ice to form inside the body**	They use Cryoprotectant - they add glucose to cells, AND, they control the ice formation by creating special proteins for ice to form around = nucleating sites
139.	**Hydrogen Cyanide (HCN)**	As many as 1,000 species plants sythesize this
140.	**Hydrogen Cyanide (HCN)**	Taste bitter and is extremely toxic - so toxic that it cannot exist freely in plant or animal cells so are stored in a form that is bound to other molecules
141.	**Hydrogen Cyanide (HCN)**	Harmless as long as the plant tissues stay intact but when liberated (thus an inducible defence)
142.	**Hydrogen Cyanide (HCN) Examples**	Bracken, Roses, Clover
143.	**Increasing body insulation to trap air and body heat - Birds**	Also trap more body heat when they fluff up their feathers - Examples: Black-capped chickadees - mere half inch feathers, from outside of feathers to skin - difference of 90 degrees Fahrenheit
144.	**Increasing body insulation to trap air and body heat - Birds**	Increase feather mass in two layers: (1) contour feathers outside, (2) down feathers underneath contour
145.	**Increasing body insulation to trap air and body heat - Birds**	Some increase total feather mass by 50% - Example: Goldfinches
146.	**Increasing body insulation to trap air and body heat - Mammals**	On the outside of their bodies grow extra hair - two coats (1) Outer coat gets thicker - longer coarser guard hairs, (2) Put on long johns - Woolly underfur; Example: Foxes
147.	**Inducible**	Only produced when under attack: components mix together when chewed
148.	**Insect growth hormones**	Insects go through changes, larva to adult
149.	**Insect growth hormones - 2 important kinds**	Moulting Hormone (MH) and Juvenile Hormone (JH)
150.	**Juvenile Hormone**	An overdose can be lethal
151.	**Juvenile Hormone**	Balsam Fir produces this hormone
152.	**Juvenile Hormone**	Important in early stages of development and is not produced at maturity

153.	**Juvenile Hormone**	Some plants produce this hormone - when the insects eat the plant it keeps getting this hormone in their diet and the larva cannot change to an adult, therefore they are locked in "childhood" forever and also cannot reproduce
154.	**Lignin**	Provides woodiness in stems and toughens leaves
155.	**Lignin**	Another structural agent, also impregnates and stiffen cell walls
156.	**Mafia Defence**	Some plants employ this defences - plants call in predators to kill the attackers HOW? They release chemicals that attract predatory insects
157.	**Mammals are not**	Freeze-tolerant
158.	**Many insects survive above the frost line EXAMPLES**	Praying Mantid
159.	**Masquerade**	Having shapes and colours or patterns that resemble something that is not part of the general background and is inedible
160.	**Masquerade (Background Mimicry)**	Having the same physical appearance as part of the environment
161.	**Masquerade (Background Mimicry) Examples - Bark Mimics**	Gray Tree Frog, Eastern Screetch Owl
162.	**Masquerade (Background Mimicry) Examples - Dead Leaf Mimics**	Anglewing Butterflies, certain moths
163.	**Masquerade (Background Mimicry) Examples - Live Leaf Mimics**	Luna Moths
164.	**Masquerade (Background Mimicry) Examples - Thorn Mimics**	Treehoppers
165.	**Masquerade (Background Mimicry) Examples - Twig Mimics**	Walking sticks, inchworms, caterpillars
166.	**Masquerade Examples**	Spit or Froth (Spittlebugs), bird poop (Bird-dropping Moths, Viceroy Butterfly Catterpillars)
167.	**Migration**	Is mainly a response to food supply but solves the temperature problem as well
168.	**Migration**	While many animals escape the cold by going dormant, other escape by leaving and having regular movement
169.	**Migration**	Best known in birds: A few ectotherms (monarch butterfly, green darner dragonfly, one local mammal - red bat)
170.	**Migration - Arctic Tern**	Flies 20,000km (12,000 miles) roundtrip
171.	**Migration - Red Knot**	Just found to fly non-stop 5,1000km in 8 days
172.	**Migration - Sandpipers**	Much greater distances - Fly non-stop night and day
173.	**Migration - Semiplamated Sandpiper**	Flies 4,000-5,000km (several thousand miles) in 3.5 days
174.	**Migration - Songbirds**	Fly 500km (several hundred miles) each night, put down, feed, rest in stopovers
175.	**Migration Examples**	Flycatchers, Swallows, Warblers, Songbirds - All eat insects, AND, Sandpipers - eat worms
176.	**Mobbing**	When a group of birds vocally and physically harasses a predator until it leaves their area
177.	**Mobbing Examples Crows**	Mob great horned owls
178.	**Mobbing Examples Small Birds**	Mob small owls
179.	**Mobility Problem**	For those animals that stay active, cold temperatures bring a second major problem: Snow, builds up and gets deeper
180.	**Mobility Problem Solutions - Behavioural**	Walk in tracks of others (Wolves), use the body as a toboggan (Otters and Mink)
181.	**Mobility Problem Solutions - Physical**	Long legs (Moose), Snowshoes (Snowshoe Hard, Fisher, Linx, Marten, Ruffed Grouse (grow their own snowshoes)

182.	**Mobility Problem Solutions - Behavioural**	Use of subnivean space - small mammals, move to areas of less snow (Moose go to hemlock groves and White-tailed deer go to hemlock or cedars - WHY? There is food in low areas, cedars especially, and less snow, not compacted under trees makes it easy to walk, safety in numbers)
183.	**Most birds migrate...**	at night: less danger, less wind, less dehydration (bodies are aircooled)
184.	**Most energy efficient flight =**	no flapping at all (Hawks)
185.	**Moulting Hormone**	It allows insects to go through different larval stages
186.	**Moulting Hormone**	Common in ferns - Hardly ever eaten
187.	**Moulting Hormone**	It is not produced at maturity,so when insects eat plant-produced ecdysone and get too much in their system - it results in malformation, sterilty, and early death
188.	**Moulting Hormone**	Ecdysone (A number of types) - required for the shedding of the exoskeleton during moult (change)
189.	**Movements**	Visual Scanners - Eyes
190.	**Movements - American Bittern**	Eyes are down by the bill because the head goes straight into the air for safety
191.	**Movements - American Woodcock**	Eyes are placed at upper back of head because they feed by their long beak so their heads are constantly down
192.	**Movements - Eyes located in middle of the sides of the face**	For better coverage and greater collective field of view - Rabbit and dove can see 360
193.	**Mullerian Mimicry**	When a group of animals all look alike and all have a nasty defence such as bad taste, a sting, poison spines, etc.
194.	**Mullerian Mimicry**	All look alikes share a true defence so their aposematic colouration is an honest advertisement
195.	**Mullerian Mimicry Example**	Many species of wasps and bees look alike (and they all sting)
196.	**Navigation**	Migrational compasses are used
197.	**Navigation - Daytime migrants**	Use the sun, landforms
198.	**Navigation - Most birds**	Use the Earth's magnetic field - likely detected by a photopigment in the eye that interacts with the Earth's magnetic field
199.	**Navigation - Nocturnal Migrants**	(most songbirds) use the moon and stars
200.	**Not all animals stay active when the temperature drops**	Ectotherms cannot because their body temperature drops with environment - they go dormant as body core temperature drops.
201.	**One reptile is freeze tolerant**	Hatchling Painted Turtles (but not any older than hatchling)
202.	**Other True or Deep Hibernators**	Meadow Jumping Mice and Woodland Jumping Mice
203.	**Phototoxins Example**	St. John's-Wort
204.	**Pishing**	A bird call - elicits a mobbing reaction in small birds
205.	**Plant Defence: Body Armour**	Spines, Thorns, Prickles, Stinging Hairs (Rasberry, Blackberry, Cactus, Thistle, Hawthorn)
206.	**Plant Defence: Body Armour**	Tough Epidermis ("outerskin") bark and woody stems; trees, shrubs
207.	**Plant Hormones that directly affect animals reproduction**	Reproductive Hormone
208.	**Plant Hormones that indirectly affect animals reproduction**	Moulting, Juvenile and Anti-Juvenile
209.	**Plant Visual Warnings**	Warning Colour - Aposematic colouration of fruit
210.	**Plant Visual Warnings**	Visible deposits of toxins on leaf surface
211.	**Plants have**	Warning odours and Visual warnings
212.	**Playing Dead**	Thanatosis
213.	**Playing Dead Examples**	Hog-Nosed Snake, Blister Beetle, Opossum
214.	**Poison Spines**	Hairs that are branched and tipped with toxins - animals who have stiff hairs with poison tips
215.	**Poison Spines**	Monkey Slug, Io Moth Caterpillar (aposematic colouration)
216.	**Putting on an extra layer inside the body**	Increase stores of body fat

217.	**Putting on an extra layer inside the body - Mammals**	Brown fat is a high efficiency fuel - generates more heat when metabolized than does white fate = heating pad (Examples: Voles and other small mammals)
218.	**Putting on an extra layer inside the body - Mammals**	Store brown fat near the heart and other vital organs
219.	**Putting on an extra layer inside the body - Subcutaneous Fat Reserves (in birds)**	Much of the fact is burned as fuel, heat is generated as byproduct
220.	**Putting on an extra layer inside the body - Subcutaneous Fat Reserves (in mammals)**	Subcutaneous white fat is important for insulation
221.	**Rectal plug =**	Tappen
222.	**Reducing the amount of heat being lost through extremities**	Rete Mirable or "wonderful net" = coutner-current heat exchanger in extremities (feet and tail)
223.	**Reducing the amount of heat being lost through extremities Examples**	Duck and Gull feet and Beaver tails
224.	**Reducing the surface area of body losing heat**	Lower or smaller surface are to volume ratio (nearer to 1:1)
225.	**Reproductive Hormone**	Found in clovers; affect sheep (make labour difficult, poor lactation, sterility, fewer lambs are born)
226.	**Rete Mirable**	Veins and arteries branch into network at base of extremity and warp around each other. When the veins carrying cold blood to the heart and lungs meet the arteries carrying warm blood to the outer body parts, heat is exchanged between them
227.	**Safety in numbers =**	Increased vigilance
228.	**Scents**	Using their noses (olfactory senses) smell is important
229.	**Scents Examples**	Large snout has a large nasal chamber with many folds to increase surface area = detection of odours (Moose, Deer, Etc)
230.	**Silica**	Cell walls strengthens by silica, derived from silicon - one of the most common elements in the earth's crust; silica found in grasses and horsetails
231.	**Sounds**	Not animals have large ears - Beavers have small ears which makes it easier for them to swim
232.	**Sounds**	Some insects have special ears (these are actually membranes that are sensitive to sound)
233.	**Sounds**	Auditory sense - Hearing is important to many animals
234.	**Sounds Examples - Mammals (Moose, Deer, Hare)**	Have large external ears - large and mobile pinnae to capture sound like parabolic dishes
235.	**Sounds Examples - Special Ears**	Mantids
236.	**Sounds Examples - Special Ears**	Moths Ears (Tiger Moths and Hooktip Moths) have membranes on abdome for hearing bats, when moths hear a bat they can take evasive action
237.	**St. John's-Wort**	Produces phototoxins in the glands of the leaves, flowers, and stems. When eaten, the chemical spreads in the blood through the animal to the outer surface of its body - it reacts with sunlight, making the skin super sensitive to sunburn; creates sores, infection and even death
238.	**Stages**	Larva (MH/JH), 2nd Stage (MH), Pupa (MH), Adult
239.	**Startle Patterns**	Bright colours and patterns that when exposed, startle the predator giving time for the animal to escape
240.	**Startle Patterns Examples**	Bright hind winds on bang-winged grasshoppers and underwing moths
241.	**Startle Patterns Examples**	Bright yellow on inside of legs of gray tree frog
242.	**Startle Patterns Examples**	Huge eyespots on Io Moths and Polyphemus Moth hind wings
243.	**Startle Patterns Examples**	Eyespots on sphinx moth hind wings

244.	**Startle Patterns Examples**	Ring-Necked Snake (Bright yellow under belly and ring around neck)
245.	**Striped-Skunk**	Is black and white = aposematic colouration for warning at night, use behavioural warnings first to conserve the chemical defence
246.	**Striped-Skunk**	Sprays sulphur alcohol
247.	**Supercooled animals**	Usually are dormant in a sheltered site where the temperature is moderated and they are out of wind (Examples: under bark, in crevices, on ground - best sites are near the ground under snow)
248.	**Supercooling**	When no ice forms in an animal's body and all body water stays liquid well below zero
249.	**Tannis**	Important and common in woody plants, free or stored in compatments; if they are astrigent
250.	**Tannis Example**	More in older leaves - caterpillars stop eating when this builds up
251.	**Tannis Example**	Oak - Stored separately from proteins in cell and when leaves chewed, released and bonds to proteins, changes configuration and prevent digestive enzymes from working
252.	**Terpenoids**	Over 100,000 plant species known to contain and most are bitter tasting = repulsion
253.	**Terpenoids**	Include: Cardiac Glycosides - heart poison in milkweeds
254.	**Thermal**	Use rising air columns to lift hawks (or other birds) to a great height, then glide down to the next column of rising warm air
255.	**Torpor**	a deep sleep
256.	**Toxins**	Some have dual roles - 1st: Metabolic, 2nd: Defence
257.	**Toxins**	Tens of thousands known, many plants have several types = cocktail blend
258.	**Toxins**	Often selectively stored in vulnerable tissue not yet fortified with lignin or silica (i.e. buds, young leaves, unripe fruit)
259.	**Toxins produced on demand**	Hydrogen Cyanide (HCN)
260.	**Trichomes**	Small hooked or clubbed hairs = dense tangles impede small animals (mites, small insects) - Some trichomes release sticky glandular secretions
261.	**True or Deep Hibernation**	Groundhogs - largest mammal to undergo this hibernation
262.	**True or Deep Hibernation - Groundhogs**	Hibernates below the frost line rolled-up position (lower the SA:VOL ratio), never a complete winter-long sleep, occasionally awakens, then falls back into sleep, maybe once a month
263.	**True or Deep Hibernation - Groundhogs**	Greatly reduced metabolism, bdoy temperature < 10 degree celsious - heartrate < 10 BPM
264.	**Two different ways animals generate their internal temperatures**	Endotherms and Ectotherms
265.	**Two main solutions to the cold problem**	Stay active and deal with subzero temperatures, and escape the cold either by leaving (migration) or by going dormant
266.	**Types of Dormancy - Bats**	Different low body temperature, high heartbeat - can have bouts of longer dormancy periods greater than 30 days in Hibernaculum
267.	**Types of Dormancy - Bears**	Do not go below frost line, dens very crude - under treefalls and some are lined, aroused easily (in the sense they wake up easily), do not defecate - rectal plug
268.	**Types of Dormancy - Bears**	Also "hibernate" - better called prolonged torpor or dormancy
269.	**Types of Dormancy - Bears**	Before dormancy they put on a great amount of fat by eating lots of fruits and nuts (especially beech nuts)
270.	**Types of Dormancy - Bears**	Not true hibernation, low heartbeat (drops to 8 bpm) but high body temperature (does not drop much - low 30s)
271.	**Types of Dormancy - Longer-term dormancy OR "Light Hibernation"**	All hibernators display period arousal, not deep hibernation
272.	**Types of Dormancy - Longer-term dormancy OR "Light Hibernation" Examples**	Chipmunks - heartbeat and body temperature - not deep hibernation, for they awaken and eat and crap every few days
273.	**Types of Dormancy - Periods of inactivity**	Lethargy OR Short-term dormancy (only when necessary - during severe cold, not true hibernation - little drop in the body temperature)

274.	**Types of Dormancy - Periods of inactivity Examples**	Porcupines, Raccoons, and Skunks (stay in dens)
275.	**Vibrations**	Can be sense by some animals
276.	**Vibrations Examples**	Snakes - have no ears; they sense vibrations in the ground
277.	**Vigilance**	Detection of danger involves vigilance, which often involves scanning the environment for signs of danger
278.	**Vigilance**	Being on the alert for danger
279.	**Vigilances - 3 Principles Tools Animals Have For Scanning Danger**	Auditory (Ears), Visual (Eyes), Olfactory (Nose)
280.	**Vomeronasal Organ (Jacobson's Organ)**	Special pocket in roof of mouth that has dense concentration of smell receptors
281.	**Vomeronasal Organ Example**	Snakes (also have forked tongues to pinpoint the source of the odour)
282.	**Warning Colouration**	Aposematic colouration - being brightly coloured to warm others of your defences
283.	**When an animal freeze and survives =**	freeze tolerant
284.	**When in thermal...**	Hawks soar up in a circular fashion and use rising air columns
285.	**Wound Hormones**	Are sent out by an injured leaf, gets other leaves on the hormone that induce production and transport of protenaise inhibitors (prepare for the attack, load the weapons)