Міністерство освіти і науки України
Запорізький національний університет

Лях В. О., Бойка О. А.

ПРОФЕСІЙНО-ОРІЄНТОВАНИЙ ПРАКТИКУМ ІНОЗЕМНОЮ МОВОЮ

навчальний посібник для
здобувачів ступеня вищої освіти магістра
спеціальності «Біологія»
освітньо-професійних програм «Біологія» та «Генетика»

Затверджено
вченою радою ЗНУ
Протокол№
від

Запоріжжя
2019

УДК:81’243(075.8)
Л98

Лях В. О., Бойка О. А. Професійно-орієнтований практикум іноземною мовою: навчальний посібник для здобувачів ступеня вищої освіти магістра спеціальності «Біологія» освітньо-професійних програм «Біологія» та «Генетика». Запоріжжя : ЗНУ, 2019. 90 с.

Видання складається із теоретичних відомостей з курсу «Професійно-орієнтований практикум іноземною мовою», завдань до практичних занять, прикладів опису та викладення наукового матеріалу. Вміщено розділ з завданнями для самостійного опрацювання студентами. Також у практикуму надається список основної та додаткової літератури до вивчення дисципліни. Посібник сприяє поглибленню та розширенню знань студентів щодо основних питань курсу та допомагає їм виконати обсяг завдань самостійної роботи.

Розраховано на студентів, які навчаються за спеціальністю «Біологія» за освітньо-професійними програмами «Біологія» та «Генетика».

Рецензент – *Васильченко О.І.,* к.пед.н., доцент
Відповідальний за випуск – *В. О. Лях*, завідувач кафедри СПГ та генетики

ЗМІСТ

ВСТУП

Навчальний посібник підготовлено відповідно до робочої навчальної програми дисципліни «Професійно-орієнтований практикум іноземною мовою», яка передбачає підготовку магістрів у вищих навчальних закладах IV рівня акредитації за освітніми програмами «Біологія» та «Генетика». Курс розрахований на студентів біологічного факультету денної та заочної форм навчання.

Курс належить до нормативних дисциплін та є необхідним складником підготовки майбутнього фахівця зі знанням іноземної мови для здійснення ефективної наукової міжнародної діяльності та написання ним публікацій і презентацій власних наукових досліджень.

Предметом вивчення навчальної дисципліни є іншомовний дискурс, необхідний для формування професійно-орієнтованої комунікативної компетенції, для забезпечення ефективного застосування професійної іноземної мови при спілкуванні в академічному, професійному, науковому, а також у побутовому, соціокультурному та інших середовищах.

Метою курсу є підготовка студентів до ефективної комунікації іноземною мовою в їхньому академічному, науковому, професійному оточенні.

Завданнями курсу є практичне відпрацювання навичок спілкування іноземною мовою в науковій та професійній діяльності; здобуття навичок складання мотиваційних листів та заяв для отримання грантів на фінансування чи для виїзду за кордон на стажування, розуміння та інтерпретації інформації отриманої з міжнародних науково-метричних баз та видань; відпрацювання навичок написання наукових статей для міжнародних спеціалізованих видань, подолання комунікативних та інших психологічних бар'єрів при спілкуванні іноземною мовою.

У результаті вивчення навчальної дисципліни студент повинен

знати:

- базову фахову термінологію іноземною мовою;
- основні спеціалізовані міжнародні видання та науково-метричні бази даних зі спеціальності «Біологія», можливості використання їхнього інформативного потенціалу для проведення досліджень;
- правила написання наукових статей іноземною мовою;
- правила складання анотацій до наукових робіт;
- правила підготовки доповідей на наукових конференціях іноземною мовою;
- правила підготовки мотиваційних висновків для здобуття грантів та участі у стажуванні.

вміти:

- володіти та вільно оперувати фаховою іноземною термінологією;
- користуватися сучасними міжнародними академічними виданнями

та спеціалізованими науково-метричними базами даних зі спеціальності «Біологія»;
- користуватися сучасними спеціалізованими словниками з різних галузей науки і техніки;
- володіти електронними засобами перекладу як у режимі on-line, так і за допомогою спеціалізованих програмних продуктів;
- складати анотації та резюме статей іноземною мовою;
- писати наукові статті іноземною мовою;
- писати мотиваційні листи на одержання гранту чи проходження стажування;
- готувати анотації до кваліфікаційних робіт іноземною мовою;
- розробляти презентації до доповідей та виступати на наукових конференціях.

Самостійна робота студентів є важливим складником навчального освітнього процесу, який сприяє активізації засвоєння ними знань та їхньої реалізації. Також вона належить до основних засобів опанування освітнього процесу студентом під час позааудиторної роботи.

Завданням самостійної роботи студентів є засвоєння певних знань, умінь, навичок, закріплення та систематизація здобутих знань. У посібнику вміщено матеріал для закріплення знань та відпрацювання навичок у вигляді текстів та тестових завданьз окремих розділів біології, які стосуються дисциплін що було вивчено під час навчання. Одночасно, це допомагає розширити та закріпити знання зі спеціалізованих професійних дисциплін. Також самостійна робота з цієї дисципліни передбачає написання наукової статті та мотиваційного листа для отримання фінансування чи стажування за кордоном.

THEORETICAL PART

Study the following information:

Наукові англомовні праці за своїм написанням відрізняються від розмовного та художнього стилю. У них викладення матеріалу ведеться від третьої особі, часто від колективу авторів (“Ми” замість “Я”, “нами” замість “мною”) та широко застосовується *Passive voice* – “дані було опрацьовано”, “проаналізовано” і таке інше. Самі ж цифри, дані не виконують жодної дії.

Викладення матеріалу в англомовних статтях здійснюється послідовно, при цьому використовують офіційний стиль мовлення та уникають діалектних та сленгових виразів.

Крім того, зверніть увагу на те, що переклад одного й того ж слова, в залежності від галузі науки, може бути зовсім різним та відрізнятися від значення слова в побутовому мовленні. Наприклад: “*shell”* – “мушля морських чи річкових тварин”, а в хімії та фізиці це – “орбіталь електрону в моделі будови атому”.

Вирізняють кілька типів наукових статей, які публікуються як в українських так і в міжнародних виданнях:

1. коротке повідомлення (*Short review*) – належить до стислого повідомлення про окрему частину дослідної роботи або новий встановлений факт чи закономірність. Може мати спрощену структуру.
2. дослідницька стаття (*Research article, Research paper, Research study*) – розповідає про проведене комплексне дослідження, має всі структурні елементи та завжди містить ґрунтовні висновки, її основна частина – результати та їх обговорення – велика за обсягом.
3. оглядова стаття (*Review*) – зазвичай, аналітична стаття, що належить до критичного огляду зібраної інформації, присвячена певній тематиці, може не містити власне результатів дослідження, а бути лише оглядом літературних джерел. Структура такої статті також відрізняється від структури дослідницької статті.

Дослідницьким статтям, які є основним типом статей у біологічній галузі, властива типова структура, яка скорочено англійською мовою має назву *IMRaD-structure*. Цього плану побудови статей дотримується більшість наукових видань. Але варто зазначити, що кожне видання може мати свої спеціалізовані вимоги щодо розділів та їхнього оформлення. У наш час майже всі наукові видання мають свої власні інтернет-сайти, де розміщуються “Правила для авторів” (*Guide for authors*), у яких детально розписані вимоги оформлення матеріалів, а також часто наводяться приклади. Але навіть там часто зустрічається фраза: “Матеріали оформлюються згідно *IMRaD-structure*.”

Ця структура складається з 4 основних розділів:

“Introduction” – “вступ”

“Methods” (“*Material and methods”*; “*Material”*) – “методи” (“матеріали та

методи"; "матеріал")

"Results" – "результати"

"Discussion" – "обговорення"

Іноді два розділи можуть бути об'єднані в один – "*Results and Discussion"*("результати та обговорення").

Також стаття може мати наступні додаткові розділи:

"*Limitations*" – "умови" чи "обмеження" (часто це стосується теоретичних моделей чи медичних досліджень)

"*Conclusion*" – "висновки" "Acknowledgements" – "подяки" "References" – "перелік посилань"

На початку статті розміщується маленький розділ "*Summary"* або "*Abstract"* ("резюме" або "реферат"). І так само на початку статті розміщуються "*Key words"* – "ключові слова". Вони описують статтю – об'єкт дослідження, мету, головні отримані результати та наводять кілька слів що характеризують статтю загалом.

"Summary" або "*Abstract"* – стислий огляд статті щодо мети, матеріалів та методів і головних отриманих результатів експерименту.

"Introduction" містить огляд літератури (що вже відомо з цієї теми), інформацію щодо попередніх досліджень та того, що вже було встановлено раніше. У цьому розділі встановлюються об'єкти та мета дослідження.

"Material and methods" пояснює, які матеріали було використано для проведення дослідження та які методи було застосовано. Методика прописується за своїми основними етапами, подається інформація щодо методів аналізу та обробки отриманих даних.

"Results" описує отримані дані.

"The Discussion section" містить пояснення до отриманих показників, описує обмеження та особливості використання отриманих даних та надає можливі пояснення причин явищ, зафіксованих під час досліджень. Також у цьому розділі висловлюються гіпотези та припущення, побудовані на основі проведених досліджень. Часто описуються майбутні дослідження чи план продовження розпочатих цією статтею дослідів. Якщо в вимогах немає окремого розділу з висновками, то висновки також розміщуються саме в цьому складнику.

Наприкінці статті автори можуть висловити "*Acknowledgements"* ("подяки") установам чи приватним особам, що брали участь у дослідженнях чи фінансували їх.

Нарешті, на завершення статті наводиться "*References"* ("перелік використаних джерел", "перелік посилань"), що складається зі списку книг, статей чи інтернет-посилань, які було використано при написанні статті.

Для кращого сприйняття великого обсягу даних їх, найчастіше, об'єднують у таблиці або діаграми. Щодо особливостей складань таблиць англійською мовою варто відзначити те, що всі назви досліджуваних об'єктів краще подавати латинню, щоб уникнути можливих непорозумінь. Дробові числа, англійською пишуться не через кому, а через крапку: 9.8; 10.35; 101.774...

Назва таблиці подається перед таблицею:

Table 1 – Name of the table

For example:

Table 1. Average values of fresh forage yield (t ha^{-1}) in the sole crops of field mustard and autumn-sown annual legumes and cereals in the trial at Rimski Šančevi for 2013 and 2014

Crop	Species	Fresh forage yield
Brassica	Field mustard	75.1
Annual legume	Common vetch	40.4
	Hairy vetch	42.5
	Hungarian vetch	35.7
	Pea	50.1
	Average	42.2
Cereal	Barley	49.2
	Common wheat	40.4
	Oat	40.1
	Triticale	50.5
	Average	45.1
$LSD_{0.05}$		7.7

Table 2 . Leaf morphology of interspecific hybrids of honesty and their parental species

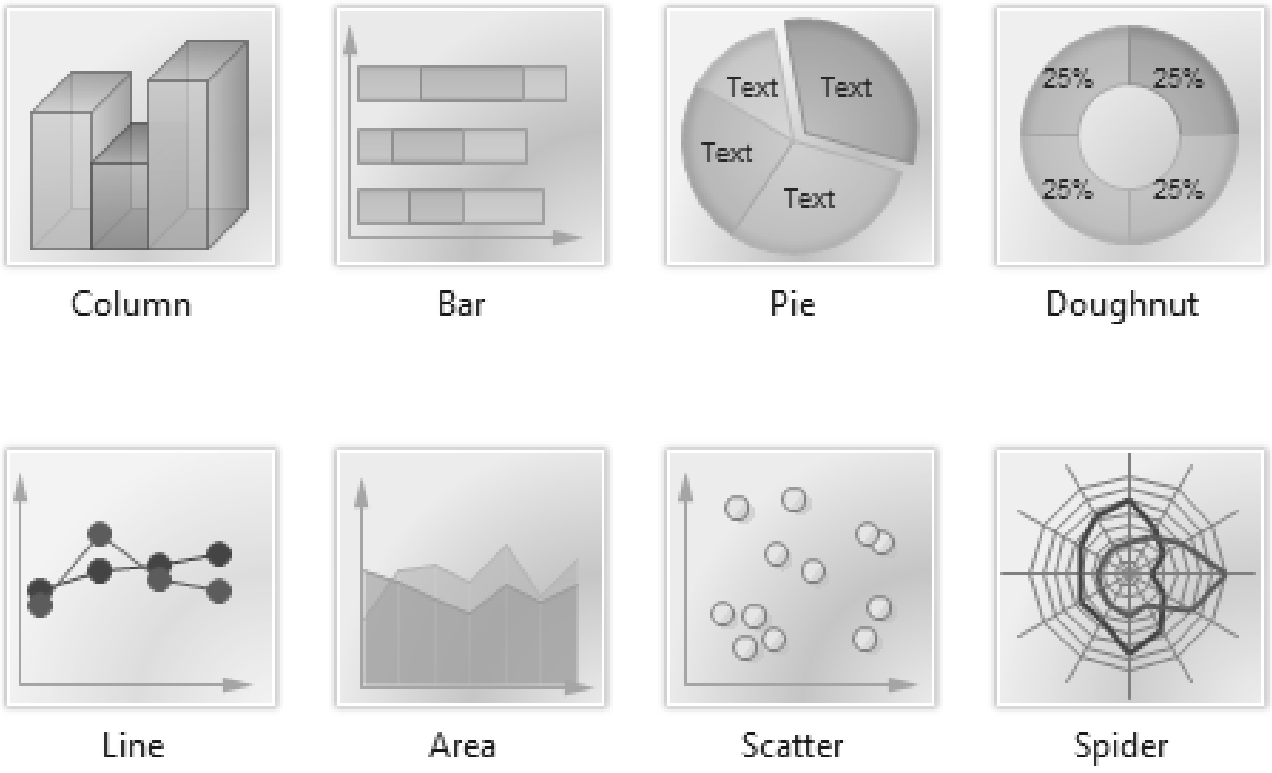
Genotype	Leaf tip shape	Leaf wings, points	Leaf wide, sm	Leaf length, sm
Lunaria annua	Sharp	1 (small)	10,2 ± 0.22	9,5 ± 0.14
Lunaria rediviva	Round	3 (large)	11,4 ± 0.14	9,0 ± 0.12
♀ ***Lunaria annua*** × ♂ ***Lunaria rediviva***	Narrow triangle	2 (medium)	13,5 ± 0.30^{a,b}	10,5 ± 0.22^{a,b}
♀ ***Lunaria rediviva*** × ♂ ***Lunaria annua***	Wide triangle	2 (medium)	12,5 ± 0.12^{a,b}	10,0 ± 0.24^{b}

^{a,b} – differences from *L. annua* (a) and *L. rediviva* (b) are significant at P < 0,05

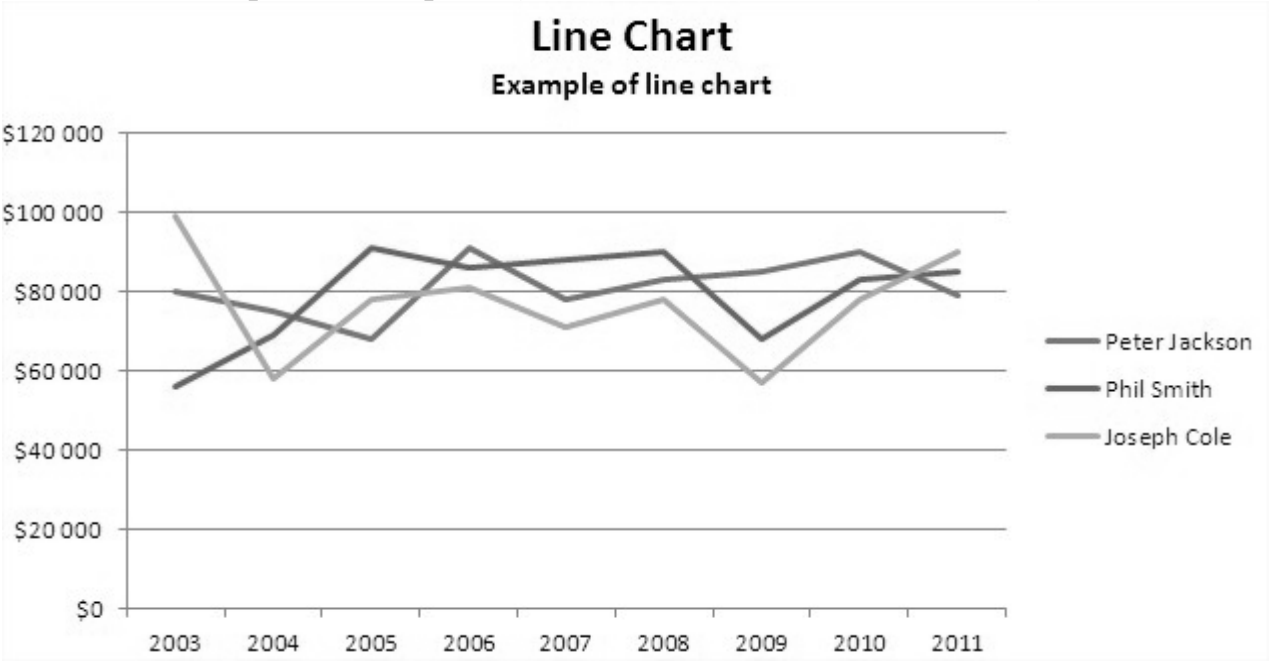
Table 3. Analysis of variance for Percent of cultured plate responded and percent of explantsresponded

Percent of cultured plate responded				
Source of Variation	**df**	**MST**	**F-value**	**SEm (±)**
Medium	4	291.32	7.66**	4.594476
Genotype	1	757.0747	19.92**	1.83779
Medium X Genotype	4	700.2971	18.43**	9.188952
Error	20	37.99658		
Percent of explants responded				
Medium	4	464.7547	36.232**	2.669913
Genotype	1	230.5993	17.977**	1.067965
Medium X Genotype	4	851.1096	66.351**	5.339826
Error	20	12.82731		

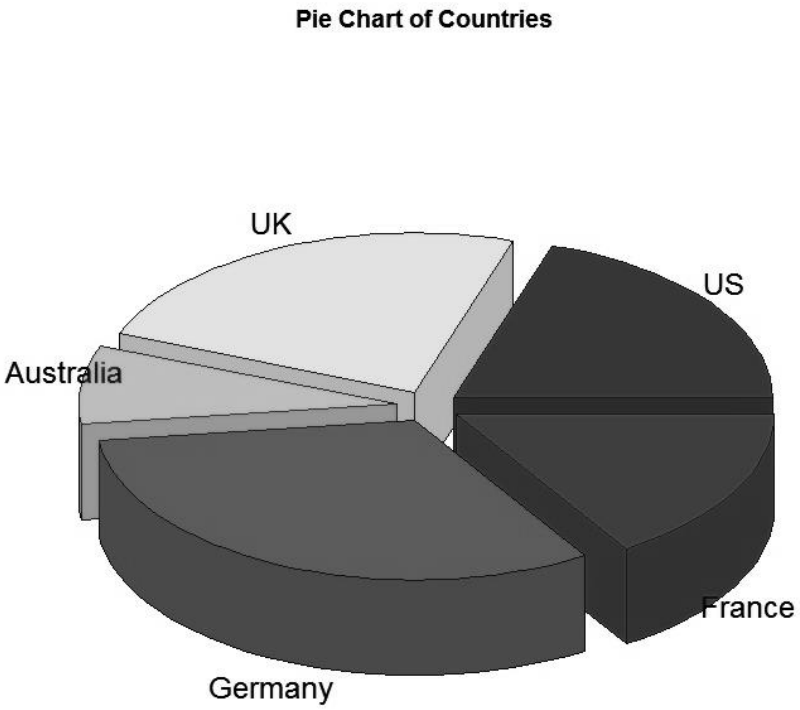
Існує кілька різновидів схем та діаграм.



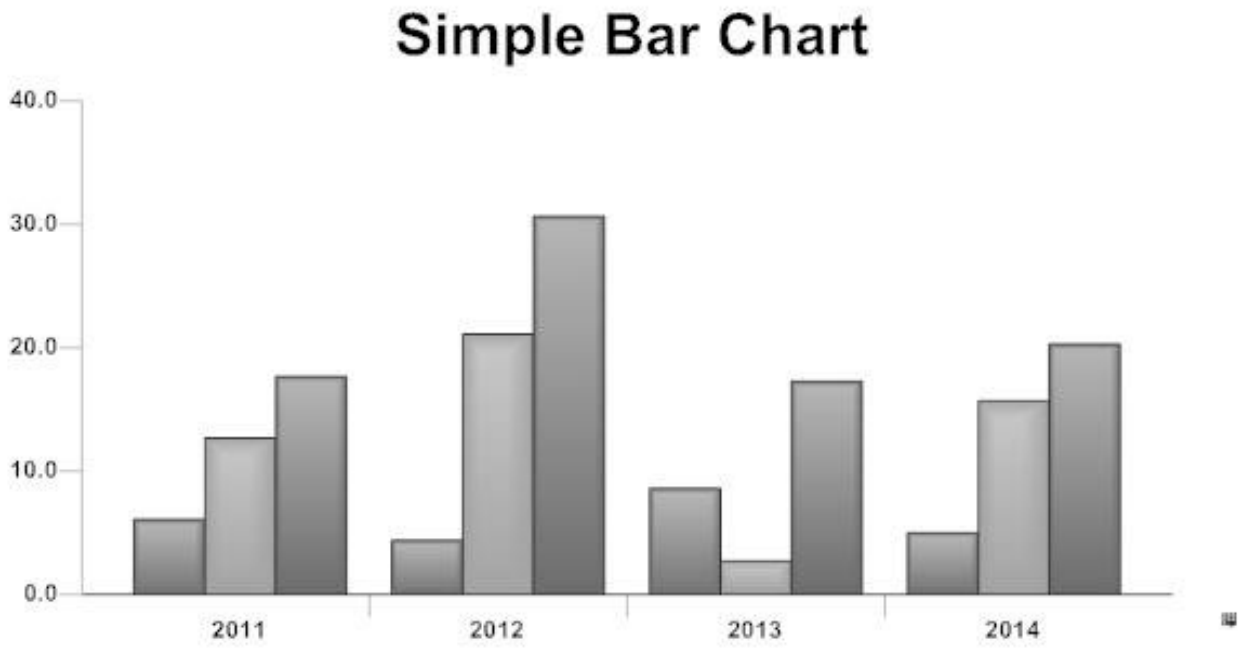
Серед них вирізняють звичайні графіки (*Line graph*), у яких як складові елементи виокремлюють ряди (*line A, line B, line C, line X, line Y*).



Матеріал може бути подано у вигляді схем чи діаграм (*chart*). Це може бути кругова діаграма (*pie chart*), складові частини якої мають назву *segment* або *slice*.



Ще одним видом діаграми є так звані “*bar charts”*, які складаються зі стовпчиків, що розташовуються горизонтально чи вертикально. Вони можуть мати або ні координатних вісей.



Для кращого сприйняття інформації, яка часто викладається, використовують наочне пояснення у вигляді рисунків, фотографій, моделей тощо. Англійською мовою вони називаються *“figure”* або скорочено *“fig”*. Зауважте, що слово *“figure”* також перекладається як “цифра”, а тому може також зустрічатися у науковій літературі і в іншому контексті. Тож при перекладі слід бути дуже уважними. Підпис може розташовуватися як поруч з малюнком, так і над чи під ним.

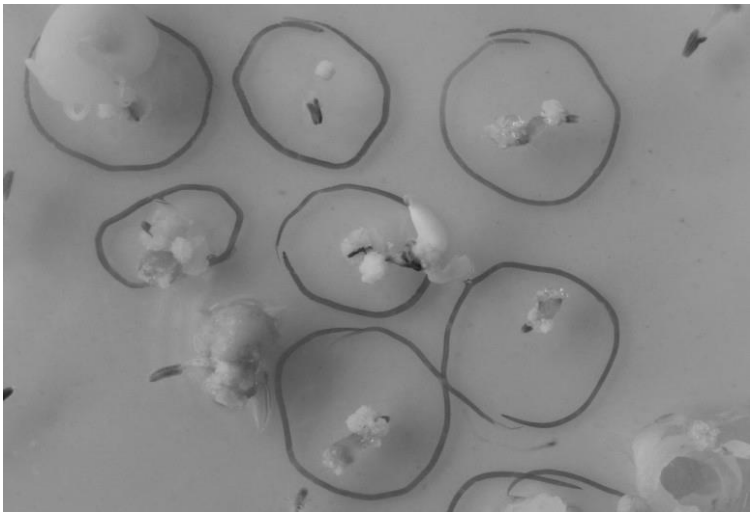
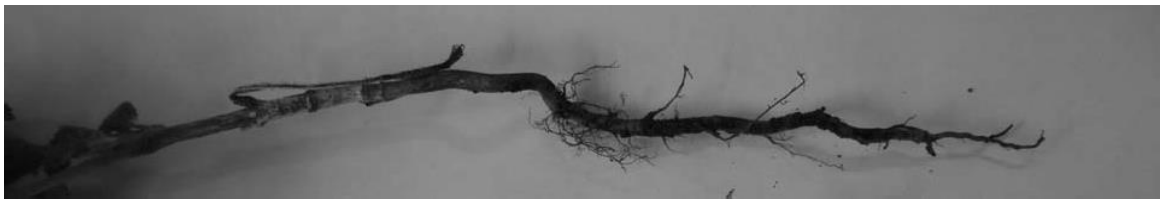


Fig: 1 Response of anthers of tropical cauliflower variety Sabour Agrim

Figure 2. Root without tubers in *Lunaria annua* plant



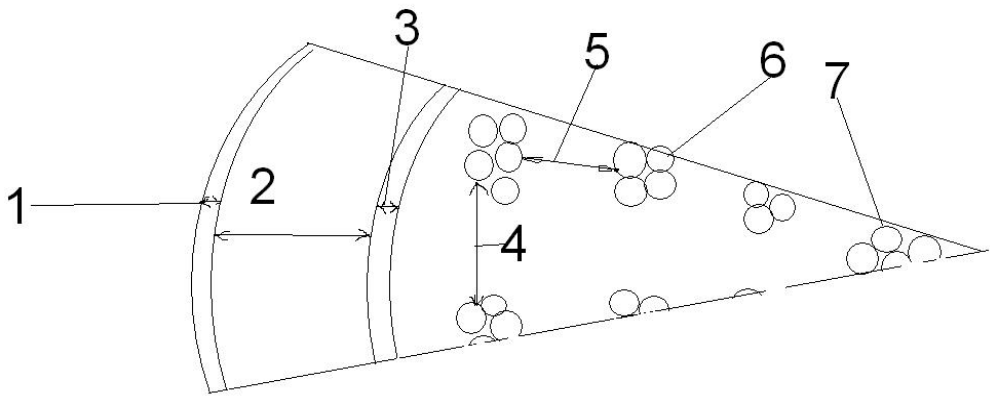


Figure 3. Anatomical structure of nodal root in *Lunaria rediviva*:

1 - epidermis; 2 –secondary phloem; 3 - cambium;4 – distance between xylem rays; 5 –distance between groups of vessel elements; 6 –vessel elements; 7 –central cylinder

Під час проведення дослідів часто для отримання даних використовують ті чи інші математичні формули та вирази. Існують певні правила читання математичних формул, наведені нижче:

a=b	a [ei] equals b [bi:] or a is equal tob
$a_2=b_d$	a sub two is equal to b [bi:] sub d[di:]
$\frac{a+b}{a-b}=\frac{c+d}{c-d}$	a plus b over a minus b is equal to c plus d over c minus d
$a^3=\log_c d$	a cubed is equal to the logarithm of d to the base c
$F_{(z)}=b\left[\left({}^{z}/_{c_m}\right)^m-1\right]$	F of z is equal to b, square brackets, parenthesis, z is divided by c sub m, close parenthesis, to the power m, minus 1, close brackets
$\frac{20}{5}=\frac{16}{4}$	the ratio of twenty to five is equal to the ratio of sixteen to four
a'	a prime
a''	a second prime
9^2	nine squared or, nine to second power
6^3	six cubed or, six to third power
c^{18}	c [si:] to eighteenth
a^{-10}	(power) a to the minus tenth (power)
$\sqrt{4}=2$	the square root of four is equal to two
$\sqrt[3]{a}$	the cube root of a
$\sqrt[5]{a^{-2}}$	the fifth root of a squared
$L=\sqrt{R^2+x^2}$	L equals to square root of R squared plus x squared
$\frac{\sqrt{F_1+A}}{2x''_d}$	square root out of F first plus A divided by two x d^{th} second prime
$a^m=\sqrt[n]{a^m}$	a to the m^{th} is equal to the n^{th} root of the m^{th} power
$\int\frac{dx}{\sqrt{a^2-x^2}}$	indefinite integral by dx divided by the square root out of a squared minus x [eks] squared
$\frac{d}{dx}\int_{x_0}^{x}X_{dx}$	d divided by dx of the integral from x_0 to x of X large dx
$4c+w_3+2m_1$	four c plus w third plus two m first
$a'+R_a=33\frac{1}{3}$	a prime plus R a^{th} is equal to thirty-three one third

При проведенні досліджень та для опису отриманих результатів інколи потрібно для кращого викладення матеріалу округлити показники. Округлення даних може бути в бік збільшення або зменшення фактичної цифри. Округлення – "*Rounding data"* – це прийом, який часто використовується при написанні науковихстатей.

Якщо Ви отримали показник 41,3, то Ви можете написати про це наступним чином:

approximately 41	приблизно 41
by about 41	приблизно 41
around 41	навколо 41
roughly 41	грубо (приблизно) 41
almost 41	майже 41
nearly 41	біля 41
more than 41	більше за 41
over 41	над 41
just up 41	трішки над (трішки більше ніж) 41

Якщо Ви отримали, наприклад, показник 9,8%, то Ви можете написати:

approximately 10	приблизно 10
by about 10	приблизно 10
around 10	навколо 10
roughly 10	грубо (приблизно) 10
almost 10	майже 10
nearly 10	біля 10
less than 10	менш ніж 10
just under 10	трішки менше за 10

Схема складання та представлення усної доповіді з презентацією на конференції, круглому столі, симпозіумі:

1. привітання присутніх;
2. представлення себе;
3. повідомлення теми доповіді;
4. пояснення чому ця тема так важлива;
5. головна частина:
- стисло ще раз назвати тему;
- об’єкти;
- виділяти початок кожної частини;
- зміст кожної з частин;
- виділяти закінчення кожної частини;
- підкреслити головні твердження;
- підкреслити головну ідею;
- головні висновки;
6. висновки:
- перейти до закінчення;
- підсумувати головні позиції;

- виділити основний висновок;
- пояснити його значення;
- завершити виступ;
- запропонувати задати питання;

7. запитання та відповіді;

- уважно вислухати запитання;
- впевнитись, що правильно зрозуміли запитання;
- перефразуйте запитання своїми словами;
- якщо не знаєте відповіді, так і скажіть, але пообіцяйте розібратися в цьому питанні;
- відповідайте на запитання, що не стосуються безпосередньо доповіді швидко, стисло, але коректно;
- запитайте, чи задоволеній вашою відповіддю Ваш опонент.

Існує три основні типи автобіографій або резюме:

1. хронологічний – викладання інформації починається від теперішнього часу та в минуле;
2. функціональний – у ньому наголошується на професійних навичках та вміннях;
3. змішаний – поруч із поданням інформації щодо освіти та досвіду роботи у ньому роз'яснюються виконувані обов'язки та вміння.

Логічна схема змішаного (найбільш розповсюдженого) резюме:

- ПІБ;
- контактна інформація;
- освіта;
- опис трудової діяльності;
- рекомендації, грамоти,нагороди.

? Checklist

- What information must you write in the Introduction?
- Where and how do you describe your research methods?
- How must you read math formulas?
- What is the main idea of your curriculum vitae?
- What scheme do we use when we present our work for another scientist?

Write the following information to your own dictionary and study:

KEYWORDS AND EXPRESSIONS	
English	Ukrainian
Написання наукових статей, рефератів, повідомлень	
goal aim purpose	мета
topic theme	тема
general	загальний
special specific particular	особливий спеціальний
change alter	змінювати
article paper study	стаття
research paper	дослідницька стаття
review	огляд, оглядова стаття
short review	стислий (короткий) огляд
briefly	стисло
benefit	перевага (вигода)
advantage	перевага
harm	шкода
good	добрий (гарний)
bad	поганий
positive	позитивний
useful	корисний
useless	даремний
to be conducted with	бути пов’язаним із
to happen	відбувається
to occur	спостерігати
to show	показувати
to demonstrate	демонструвати

to assess	досягати
to receive	отримувати
to obtain	
to get	
to detect	виявляти
to discover	відкривати
to respond	відповідати
to reply	реагувати
to confirm	підтверджувати
to provide evidence	надавати докази
to suggest	запропоновувати
to fail to	не зробити
to determine	визначати
to investigate	досліджувати
to evaluate	оцінювати
to measure	вимірювати
to establish	встановлювати
to effect	впливати
to affect	
to impact	
to cause	викликати
to lead	вести, бути причиною
to fall	знижуватись
decline	зниження
decrease	
increase	збільшення
to go up	збільшуватись
to go down	зменшуватись
to rise	зростати, збільшуватись
downward	зниження
upward	збільшення
to emphasize	підкреслювати
to note	відзначати
research	дослідження
findings	знахідки, відкриття
records	записи
to record	записувати
reason	причина
because of	тому що
as a result of	як наслідок
one of the problem about	одна з проблем (тем)
one of the problem with was(is)	одна з проблем (тем) була (є)
to remain the same	здаватись таким самим

to exceed	перебільшувати
to reach a peak	досягати піку (верхівкової межи)
to remain steady to remain constant	залишатися незмінним
to imply	передбачувати
to separate	розділяти
result	результат
trend	тенденція
important	важливий
reliable	надійний
slight	незначний
tiny	крихітний
steady	постійний
sharp	виразний
gradual	послідовний
significant	значний
marked	помітний
to be at a peak	бути у найвищій точці
rapid	різкий (швидкий)
quick	швидкий
steep	різкий
huge	величезний
recovery	відновлення
to level out	вирівнюватися
to reach a maximum	досягати максимуму
to reach a minimum	досягати мінімуму
to represent	представляти
our study show	наше дослідження показало
our study confirm	наше дослідження підтвердило
our study provide evidence	наше дослідження надало докази
we are suggest	ми передбачаємо
our study failed to ...	наше дослідження не спромоглося
In the first place	у першу чергу
One reason (reasons) for this is... Another is...	Одна з причин цього ... Інша (причина)
In addition ...	До того ж, ...
Moreover, ...	Більш того ...
One of the problem about ...	Однією із задач було ...
One of the problem with ___ was (is) ...	Одна проблема з це було (є) ...
As a result of ...	Як результат ...
They are both ...	Вони обидва ...
But / on the other hand (side) ...	Але / з іншого боку ...
The main differences between ...	Головна різниця між ...

The main differences is that *something* is ...	Головна різниця полягає в тому, що щось є ...
While (whereas) *something* is *something else* is	У той час, коли щось таке, щось інше
Also / Another thing is (that) *something* is *what* than *something else*	Також / Інша різниця є те що щось якесь в той час коли щось інше
Something was a *how* (twice, three times) as *how* (effective, bigger, common …) as *something else*	Щось було якось (вдвічі, втричі, ...) якось (ефективніше, більше, більш звичайне, ...) ніж щось інше
The number of *something* in *when* was *how* that in *when*	Кількість чогось у термін чи дата було якось ніж у термін, дату
There was a *what and how* in the number of *something else* between *when* and *when*	Щось було якимось ніж кількість чогось іншого між (терміни чи дати)
Міжособистісне спілкування	
Звертання	
Mr., Mrs., Miss + прізвище	звертання до малознайомих, до друзів звертаються лише на ім’я
Madam	продавці, посадовці-жінки, жінки
Sir	чоловіки, чоловіки-службовці
Sir + прізвище	звертання до аристократів
Doctor	лікарі
Doctor + прізвище	людина з науковим ступенем
Professor	професор
General, Colonel, Captain	генерал, полковник, капітан
Ladies and Gentleman	Пані та панове (до аудиторії)
Mr. / Madam Chairman	до голови
Officer	до полісмена
Waiter, Waitress	офіціант, офіціантка
Nurse	медична сестра
Excuse me, please!	безособова форма звертання
Привертання уваги	
Excuse me, please!	Вибачте, будь ласка!
May / Can I have your attention, please!	Можу я привернути Вашу увагу?
Attention, please!	Увага!
Look here!	Дивиться! Подивиться!
Just a minute!	Хвилиночку! (щоб зупинити когось)
Hey!	Гей!
Look out! Watch out!	Обережно! (попередження про щось)
Знайомство	
Have you met?	Ви знайомі?
I don’t think you’ve met	Я не думаю, що ви знайомі
May I introduce (myself)	Можу я відрекомендувати (відрекомендуватися)

Let me introduce	Дозвольте представити
I’d like you to meat	Я би хотів познайомити
This is …	Це ...
Meet …	Знайомтесь ...
Please to meet you!	Приємно познайомитись!
Glad to meet you!	Радий знайомству!
Вітання	
Good morning!	Доброго ранку (до 12)!
Good afternoon!	Добрий день (до 17-18)!
Good evening!	Добрий вечір!
Good night!	Добраніч!
Good day!	Доброго дня!
Hello!	Здраствуйте!
Hi!	Привіт!
Прощання	
I must be going (now) I must go (now)	Я мушу йти
I’m afraid I must be going	Боюся я, що я мушу йти
It’s time I was going It’s time I was off	Час йти
I’d better be going	Краще я піду
I must be off now	Мені необхідно йти
Good-bye!	До побачення!
Good-bye for now!	До побачення поки що
Bye! / Bye now / Bye than / Bye-bye!	Прощавай!
Cheerio!	Чао!
See you!	Побачимось!
I’ll be seeing you!	Ще побачимось!
All the best!	Усього найкращого!
Good luck!	Хай щастить!
Прохання	
Наказове речення + please	Прохання зробити щось + будь ласка
Will you / Could you / Would you	Чи не могли б Ви?
Would you mind?	Чи не зробили б Ви?
Would you be so kind as to	Будьте настільки ласкавим, щоб …
Відповіді на прохання	
Yes	Так
Certainly	Звичайно
Of course	Безперечно
All right	Добре
Ok, here you are	Так, тримайте
Not at all	Неважко
Not at least	Зовсім неважко

Not at bit	Ніяких труднощів
I’m afraid I can’t	Боюся, що я не можу
I’m sorry I can’t	Вибачте, але не можу
No, I can’t	Ні, я не можу
No, I won’t	Ні, я не буду
Прохання дозволу	
May I? Can I / Could I?	Чи можу я?
Could I possible?	Чи можу я попрохати про послугу?
Do you think I could? I wonder if I could	Скажіть, я можу? (коли невпевнені)
Do you mind if I	Не заперечуєте якщо я? (про намір)
Would you mind if Is it all right if I	Не заперечуєте якщо? (припущення)
Відповіді на прохання дозволу	
Yes	Так
Certainly	Звичайно
Of course	Безперечно
Go ahead!	Дійте!
If you like / want	Якщо хочете
No, that’s all right!	Так, усе гаразд
Вибачення	
I’m (very / so) sorry	Я прошу вибачення
I’m terrible / awfully / dreadfully sorry	Мені дуже шкода
Sorry	Вибачте
I’m afraid	Я боюсь, що я ...
Excuse me for	Вибачте мене за ...
I apologize for I do apologize for	Приношу свої вибачення за(офіційне вибачення)
I beg your pardon	Прохаю про Ваше прощення
Pardon	Пробачте
Відповідь на вибачення	
That’s / It’s (quite) all right!	Усе добре!
That’s / It’s ok.	Усе Ок.
Don’t worry!	Не переймайтеся!
Never mind!	Не звертайте уваги!
That / It don’t matter!	Це не важливо!
Being sorry won’t help!	Вибачення не допоможуть!
You should be more carefully!	Вам треба бути пильнішим!
Пропозиції	
Let’s!	Давайте
Why don’t we	Чому б нам не
Why not	Чому б ні
What about	Що до

How about	
We could	Ми могли б
We might	
I suppose we could	Я гадаю, ми могли б
Виступ на конференції, симпозіумі, круглому столі	
Let me introduce myself!	Дозвольте відрекомендуватися!
I'm (My name is) ... from ...	Я (Мене звуть) ... я з ...
I'm student ... / I work at ...	Я студент ... / Я працюю в ...
As you can see at the screen (slide), our	Як ви можете бачити на екрані
The subject of my presentation is ...	Тема моєї презентації ...
My talk is particularly relevant to those of	Моя доповідь особливо важлива для
Today's topic is of particular interest to	Сьогоднішня тема представляє
My / The topic is very important for you	Моя / ця тема дуже важлива для вас,
Before I move on to my next point (slide)	Перш ніж я перейду до наступної
As I said earlier ...	Як я сказав раніше, ...
Let's come back to ...	Давайте повернемось до ...
My next question / point	Моє наступне питання / твердження
As I mentioned ...	Як я вже згадував, ...
I'll focusing your attention on ...	Я хочу привернути Вашу увагу до...
A brief overview of our activities ...	Стислий огляд нашої активності ...
As you all know ...	Як ви всі знаєте, ...
As I've already explained ...	Як я щойно пояснив, ...
As I pointed out earlier / in the first	Як я вказував раніше / в першій
As you can see, ...	Як ви можете бачити, ...
I think we first need to identify the	Я гадаю, що спочатку ми повинні
We will have to deal with the problem of	Ми будемо мати справу з
I'd like to mention some critical points in	Я б хотів згадати деякі важливі речі,
According to the ...	Згідно з ...
Emphasizing important points ...	Підкреслюючи важливі речі ...
I'll begin / start off by ...	Я почну з ...
Than / Next / After that ...	Потім / Після цього ...
First, I'll be looking at ..., second ..., and	Спочатку я розгляну ..., по-друге ...,
Point one deal with ..., point two ..., and	Перше твердження (ідея, думка), з
I'll end with ...	Наприкінці ...
The purpose / objective / aim of this	Мета цієї презентації ...
Our goal is to ...	Наша мета – це ...
What I want to show you is ...	Що я хочу показати Вам ...
My objective is to ...	Моя мета – це ...
Today I'd like to give you an overview of	Сьогодні я б хотів надати Вам огляд
Today I'll be showing you ...	Сьогодні я покажу Вам
I'd like to inform you about ...	Я хочу повідомити Вам
During my presentation we'll be ...	Протягом моєї презентації я буду ...
In my presentation I'll focus on ...	У моїй презентації я зосередився на ...

So, let me first give you a brief overview	Тож, дозвольте мені, по-перше, дати
Let’s now move on / turn on	Давайте перейдемо до...
After examining this theme, let turn to ...	Після розгляду цієї теми давайте
Let’s now take a look at ...	Давайте подивимось...
We introduce this method to ...	Ми застосували цей метод...
That’s why ...	Ось чому...
The purpose of this step is (was) to ...	Метою цього кроку є (було)...
Nearly the end of my presentation I’d like	Наприкінці моєї презентації я б хотів
Ok, I think that’s everything I wanted to	Так, я гадаю, що це все, що я хотів
As a final point, I’d like ...	Як фінішну думку (твердження)...
I’d like to run through my main points	Я б хотів швидко повернутися до
Finally, I’d like to highlight one (two,	Нарешті, я б хотів виділити одну (дві,
In conclusion, I’d like to ...	Щоб підбити підсумок, я б хотів...
To sum up	Щоб підсумувати...
In my opinion	На мою думку...
We therefore (strongly) recommended that	Ми (наполегливо) рекомендуємо...
Are the any questions?	Чи є запитання?
And now I’ll be happy to answer any	А зараз я був би радий відповісти на
Please, feel free to ask me any questions.	Будь ласка почувайтесь вільно та
I’m afraid I didn’t (quite) catch that.	Я боюся, що я не (зовсім) зрозумів це.
I’m sorry, could you repeat you question,	Вибачте, чи не могли б Ви повторити
I’m sorry, could you ask your question in	Вибачте, чи не могли б Ви повторити
So, if I understood you correctly, you	Тож якщо я вірно зрозумів, Ви б
So, in other words you would like to know	Тож говорячи іншими словами Ви б
Does this answer your question?	Ця відповідь Вас влаштовує?
If you don’t mind, could we discuss that on	Якщо Ви не проти, чи не могли б ми
I’m afraid that’s not really what we’re	Я боюся, що це не стосується теми,
Well, actually I’d prefer not to discuss that	Розумієте, я б вважав за краще не
Well, actually I’d prefer to discuss that in a	Розумієте, я б визнав за краще
Sorry I don’t know that off the top of my	Вибачте, я цього не знаю, це не
I’m afraid I’m not in a position to answer	Я боюся, що я не можу відповісти на
I’m afraid I don’t know the answer to your	Я боюсь, я не знаю відповіді на Ваше
Sorry, that’s not my field.	Вибачте, це не належить до кола моїх
Sorry, that is not a topic of our research.	Вибачте, це – не тема дослідження.
We didn’t focus our attention on this.	Ми не акцентували увагу на цьому.
Можливі графи у CV або Application form	
Name (Surname, Family name)	Прізвище
Given name (First name)	Ім’я
Second name (Middle name)	По-батькові
DOB (Date of Birth)	дата народження
Age	вік
Place of Birth	місце народження
Sex (male, female)	стать (чоловіча, жіноча)

Marital status (single, widow, divorced,	сімейний стан (одинак (одиначка),
Children	діти
Address (Residence)	адреса проживання
Zip code	поштовий індекс
Phone, Telephone, Phone number (home,	номера телефонів (домашній,
E-mail	електронна пошта
Health (Health insurance)	медичне страхування
Life insurance	страхування життя
Driving license	посвідчення водія
PC skills (user, programmer)	навички роботи комп'ютері на
Language skills	володіння мовами
Qualifications	документи про(кваліфікація) освіту
Education background (Education)	освіта
School living certificate	шкільний атестат
Bachelor degree	диплом бакалавра
Specialist degree	диплом спеціаліста
Master degree	диплом магістра
Post-graduate school certificate	аспірантура
Doctor of philosophy in	кандидат наук
Doctor of science	доктор наук
Стажування та отримання роботи	
form, job application, application form	анкета
sick leave	лікарняний
vacancy, job opening	вакансія
driver's license	посвідчення водія
issued by/in	виданий (щодо документа)
valid	дійсний до (щодо документа)
diploma	диплом
contract	договір
job, position, occupation	посада
job title	найменування посади
to resign	відмовитись від посади
to fill a position	обійняти посаду
achievement	досягнення
salary, wages, pay	заробітна плата
invention	винахід
probationary period	випробувальний термін
research	дослідницька діяльність
to research	займатися дослідницькою діяльністю
qualification, background	кваліфікація
professional upgrading	підвищення кваліфікації

colleague	колега
pay check stub	корінець платіжного доручення
license to practice	ліцензія на роботу
profession	професія
benefits	пільги
fringe benefits, employee benefits	додаткові пільги
skill	майстерність
tax	податок
income tax	податок на прибутки
social security tax	податок на соціальне забезпечення
income tax return	податкова декларація
employer	роботодавець
disadvantage	вада
training	навчання
duties	обов’язки
job duties, job description	службові обов’язки
education	освіта
salary, pay	оплата (зарплата)
experience	досвід
manufacturing experience	виробничий досвід
professional experience	професійний досвід
work experience	досвід роботи
compensatory time	відгул
vacation	відпустка
patent	патент
pension	пенсія
to retire	вийти на пенсію
break	перерва
break for lunch	обідня перерва
coffee break	перерва на каву
letter of invitation	письмове запрошення
letter of introduction, reference	рекомендація
cover letter	супровідний лист
fee of service	плата за послуги
pay statement	платіжна квитанція
pay check	платіжний чек
training	проходження підготовки
status	статус
standing	репутація
record of service, records	послужний список
subject	предмет (навчальний)
major subject	провідний предмет
bonus	премія

cash awards, bonus, premium	грошова премія
profit	прибуток
advantage	перевага
test	перевірка
advancement	підвищення по службі
training, professional background	професійна підготовка
vocational technical training	професійне навчання
skills	професійні навички
work, job	робота
extracurricular activities	поза аудиторна робота
short-time job	тимчасова робота
part-time job	робота за сумісництвом
job in one’s special field	робота за спеціальністю
overtime	понаднормова робота
full-time job	штатна робота
to hire, to employ	наймати на роботу
employer	роботодавець
employee	працівник
time card	табель
work permit	дозвіл на роботу
schedule	розклад
resume	резюме
reference, recommendation	рекомендації
supervisor	керівник
certificate	свідоцтво
marriage certificate	свідоцтво про одруження
training certificate	свідоцтво про освіту
graduation certificate	свідоцтво про закінчення навчального
birth certificate	свідоцтво про народження
marital status	сімейний стан
employee, office worker	службовець
shift work	робота за змінами
job interview	співбесіда при влаштуванні на роботу
layoff	скорочення
specialist	спеціаліст; фахівець
aptitude, abilities	здібності
seniority, length of service	стаж роботи
insurance	страхування
life insurance	страхування життя
health (medical) insurance	медичне страхування
requirements	вимоги
to qualify, to meet with requirements	відповідати вимогам
degree	науковий ступінь

high school	середня школа
higher education (school)	вища школа
occupation	професія
engineer	інженер
lab technician, assistant	лаборант
nurse	медична сестра
expert	експерт
senior expert	старший експерт
head of a department, head of a sector	завідувач відділом
supervisor	інспектор
appointment	зустріч
assistant	помічник
department	відділ
guarantee	гарантія
opportunity	можливість
permanent	постійний
novice	новачок
strength	сильний бік характеру
weakness	недолік, вада
willing to relocate	згода на переїзд
willing to travel	згода на відрядження
willing to learn	бажання навчатися
curriculum vitae (CV)	автобіографія
Опис особистості	
active	активний
adaptable	здатний адаптуватися
analytical	аналітичний
attentive	уважний
broad-minded	із широким кругозором
constructive	конструктивний
cooperative	схильний до взаємодії
creative	творчий
determined	рішучий
diplomatic	дипломатичний
disciplined	дисциплінований
discreet	обережний
economical	економний
energetic	енергійний
enthusiastic	ентузіаст
fair	чесний
imaginative	із гарною уявою
independent	незалежний
loyal	вірний

mature	зрілий
objective	об’єктивний
optimistic	оптиміст
pleasant	приємний
positive	позитивний
practical	практичний
realistic	реалістичний
reliable	надійний
respective	такий, який викликає повагу
self-reliant	самостійний
sincere	щирий
tactful	тактовний
talented	талановитий
hardworking	працелюбний
task-oriented	цілеспрямований
solution-oriented	мотивований на знаходження рішення
motivated	мотивований
team player	командний гравець
quick and eager leaner	такий, який швидко та легко
versatile	різнобічний
clever	розумний
flexible	гнучкий
experienced	досвідчений
punctual	пунктуальний
self-started	ініціативний
organizational skill	навички організатора
interpersonal skill	навички спілкування з людьми
dependable	надійний

? Checklist

- What are the main parts of a research article?
- How can you present your own scientific work?
- Describe yourself using key-words above.
- Describe another person.
- Make a dialogue with your partner about your scientific interests.
- What visiual forms of presentation can you use to demonstrate your data?

UNIT 1
Theme: English Test

Wit & Wisdom: "An erudite fool is a greater fool than an ignorant fool". (Moliere – French playwright)

Choose the correct answer(s). One or more answers may be correct.

1 She's … university teacher.
A a B an C the Done
2 I like … small animals.
A the B – (=nothing) C every D all
3 Is this coat …?
A yours B your C the yours
4 Is Diana … ?
A a friend of yours B a your friend C your friend
5 Who are … people over there?
A that B the C these D those
6 … is your phone number?
A Which B What C How
7 Could I have … drink?
A other B an other C another
8 There aren't … for everybody.
A chairs enough B enough chairs C enough of chairs
9 They're … young to get married.
A too much B too C very too
10 Most … like travelling.
A of people B of the people C people
11 Ann and Peter phone … every day.
A them B themselves C themselves D each other
12 It's … weather.
A terrible B a terrible C the terrible
13 The plural of car is cars. Which of these are correct plurals?
A journeys B lady's C minuts D sandwiches E babies
14 Which of these is/are correct?
A happier B more happier C unhappier D beautifuller
15 This is … winter for 20 years.
A the more bad B worse C the worse D worst E the worst
16 She's much taller … me.
A than B as C that
17 He lives in the same street …me.
A that B like C as D than
18 Her eyes … a very light blue.
A are B have Chas
19 … help me?
A Can you to B Do you can C Can you

20 You … worry about me.
A not must B don't must C must not D mustn't
21 It … again. It … all the time here in the winter.
A 's raining, 's raining B rains, rains C rains, 's raining D 's raining, rains
22 I … she … you.
A think, likes B am thinking, is liking C think, is liking D am thinking, likes
23 Who … the window?
A open B opened C did opened
24 Why … ?
A those men are laughing B are laughing those men C are those men laughing
25 What … ?
A does she want B does she wants C she wants
26 I didn't … he was at home.
A to think B think C thinking D thought
27 … a hole in my sock.
A There's B There is C It's D It is E Is
28 I'll see you … Tuesday afternoon.
A at B on C in
29 What time did you arrive … the station?
A at B to C–
30 We're going … the opera tomorrow night.
A at B - C in D to
31 I went out without … money.
A some B any
32 He's got …money.
A much B many C a lot of D lots of
33 Who's there? "…"
A It's me B It is I C Me D I
34 Although he felt very … he smiled … .
A angrily, friendly B angry, friendly C angry, in a friendly way
35 I … to America.
A have often been B often have been C have been often
36 My mother … my birthday.
A always forgets B always is forgetting C forgets always
37 You look … a teacher.
A like B as C the same like
38 How many brothers and sisters …?
A have you got B do you have C are you having
39 Good! I … work tomorrow.
A mustn't B don't have to C haven't got to
40 I … smoke.
A - B use to C used to
40 Andrew … to see us this evening.
A will come B comes C is coming
42 Alice … have a baby.

A will B shall C is going to
43 I knew that he … waiting for somebody.
A is B was C would
44 … Gloria last week?
A Have you seen B Did you see C Were you seeing
45 She's an old friend – I … her … years.
A 've known, for B know, for C 've known, since D know, since
46 We met when we … in France.
A studied B were studying C had studied
47 As soon as she came in I knew I … her before.
A have seen B saw C had seen
48 This picture … by a friend of my mother.
A is painting B is painted C was painting D was painted
49 Can you … ?
A make me some tea B make some tea for me C make for me some tea
50 Try … be late.
A not to B to not
51 I went to London … clothes.
A for buy B for to buy C for buying D to buy
52 You can't live very long without …
A to eat B eat C eating D you eat
53 I enjoy … but I wouldn't like … it all my life.
A to teach, to do B teaching, doing C to teach, doing D teaching, to do
54 Her parents don't want … married.
A her to get B her get C that she get D that she gets
55 I'm not sure what …
A do they want? B do they want. C they want.
56 The policeman … me not to park there.
A asked B said C told D advised
57 I … you if you … that again.
A hit, say B 'll hit, 'll say C hit , 'll say D 'll hit, say
58 It would be nice if we … a bit more room.
A would have B had C have
59 If you … me. I … in real trouble last year.
A didn't help, would have been B hadn't helped, would have been C hadn't helped, would be D didn't help, would be
60 There's the man … took your coat.
A which B who C that D–
61 My family … thinking of moving to Birmingham.
A is B are
62 We watched a … on TV last night.
A war film B war's film C film of war
63 He was wearing … riding boots.
A red old Spanish leather B old leather red Spanish C old red Spanish leather D Spanish red old leather

64 … he gets, … .
A The richer, the more friends he has B Richer, more he has friends C Richer, more friends he has D The richer, the more he has friends
65 It's … if you take the train.
A quicker B the quicker C quickest D the quickest
66 He … very annoying.
A 's B 'sbeing
67 That … be Roger at the door – it's too early.
A can't B mustn't C couldn't
68 At last, after three days, they … get to the top of the mountain.
A could B managed to C succeeded to D were able to
69 It was crazy to drive like that. You … killed somebody.
A may have B might have C could have D can have
70 I wonder if John … this evening.
A will phone B phones
71 Who … you that ring?
A 's given B gave
72 He … quite different since he …married.
A is, has got B has been, has got C is, got D has been, got
73 This is the first time I … a sports car.
A 've driven B 'm driving C drive
74 On her birthday … .
A she was given a new car B a new car was given to her
75 We can't use the sports hall yet because it … .
A is still built B is still building C is still being built
76 I look forward … you soon.
A seeing B to seeing C to see
77 If you have trouble going to sleep, try … a glass of milk before bedtime.
A drinking B to drink C drink
78 This is my friend Joe. I … met, have you?
A don't think you've B think you haven't
79 How …!
A he works hard B hard he works
80 Which of these sentences are correct in spoken English?
A Car's running badly. B Seen Peter? C Can't come in here, sorry. D Careful what you say. E Lost my glasses. F Have heard of her.
81 Nobody phoned, did …?
A he B she C they D it E he or she F anybody
82 If you were ever in trouble. I would give you all the help you ….
A will need B would need C need D needed
83 My wife will be upset ….
A if I don't get back tomorrow B unless I get back tomorrow
84 Tell me at once … Margaret arrives.
A if B when C in case
85 It's time you … home, but I'd rather you … here.

A go, stay B went, stayed C go, stayed D went, stay
86 I wish I … more time.
A had B have C would have D will have
87John Hastings, …, has just come to live in our street.
A that I was at school with B I was at school with
C with who I was at school D with whom I was at school
88 She keeps tapping her fingers, … gets on my nerves.
A which B what C that which
89 Can you finish the job …Friday?
A till B until C by D for
90 There's a supermarket … our house.
A in front of B opposite C facing

UNIT 2
Theme: Scientific Vocabulary

Wit & Wisdom: "Curiosity is one of the permanent and certain characteristics of a vigorous mind." (Samuel Johnson – English writer, critic and lexicographer, known as Dr. Johnson)

Exercise 1. Match these words and collocations to their definitions. Translate them into your native language.

1	*abiotic*	**A**	an alcoholic drink made by fermenting malted barley with large quantities of water
2	*cotyledon*	**B**	not relating to a living organism
3	*entomology*	**C**	a substance used to kill microorganisms such as bacteria
4	*genotype*	**D**	an area of land used for growing crops and keeping animals to provide food and the buildings associated with it
5	*hare*	**E**	the green plant structure resembling a leaf that appears as a seed germinates and before the true leaves appear, developing from the embryo of the seed
6	*irrigation*	**F**	the genetic constitution of an organism.
7	*mutation*	**G**	a long-eared furry animal, similar to but larger than a rabbit, with hind legs longer than forelegs
8	*disinfectant*	**H**	the artificial supplying and application of water to land with growing crops
9	*pause*	**I**	a rest period
10	*beer*	**J**	something added in order to make something more complete
11	*supplement*	**K**	the study of insects
12	*farm*	**L**	a heritable change occurring in a gene

Exercise 2. Give 2-3 synonyms to the following words:

Decrease; reason for this is…; article; research; main; to detect.

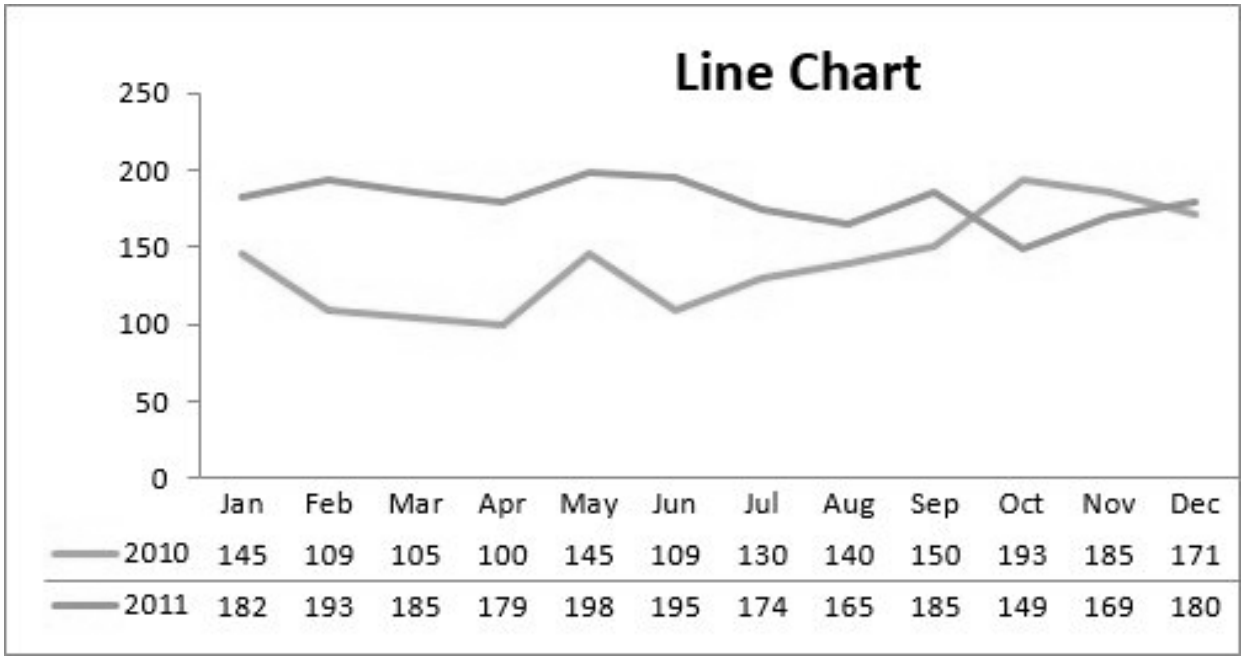
Exercise 3. Define terms below:

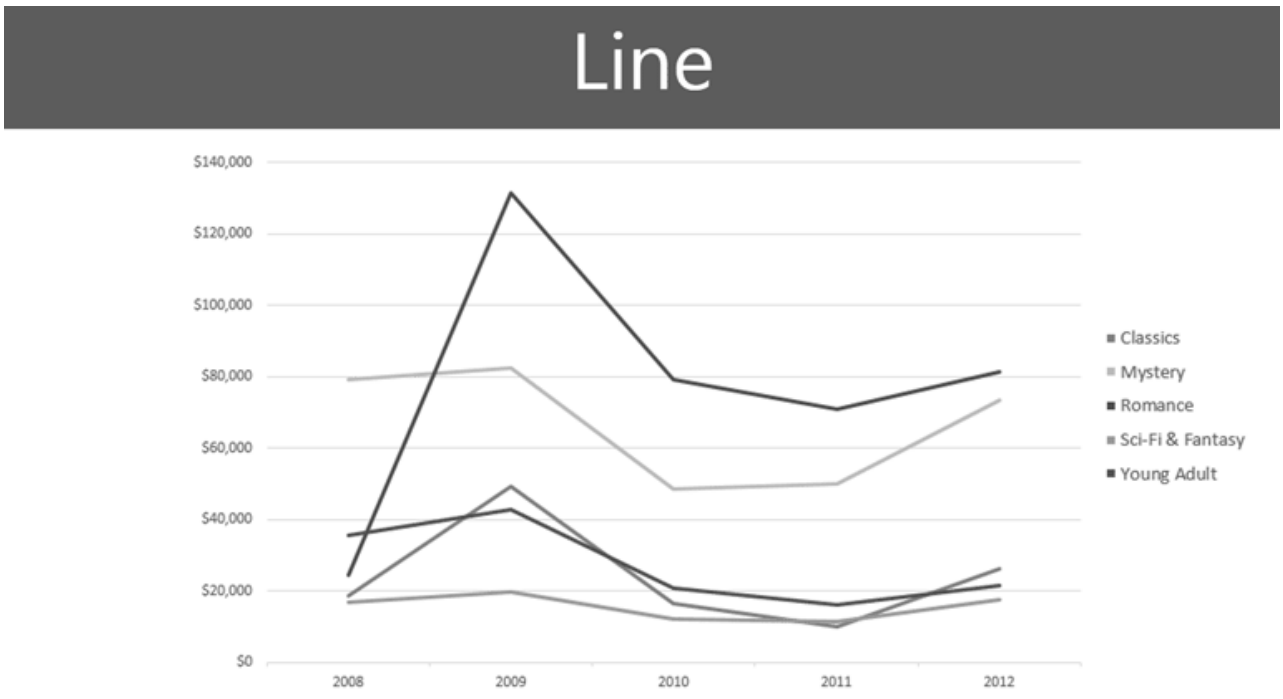
Gen, animal, plant, bacteria, zoology, pathogen, alien, nucleus, cytoplasm, substance, organ, tissue, cell, inheritance, biodiversity.

Exercise 4. Describe the following table.

	Variables					
Individuals	Gender (M/F)	Age	Weight (lbs.)	Height (in.)	Smoking (1=No, 2=Yes)	Race
Patient #1	M	59	175	69	1	White
Patient #2	F	67	140	62	2	Black
Patient #3	F	73	155	59	1	Asian
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
Patient #75	M	48	90	72	1	White

Exercise 5. Describe the following charts.





Exercise 6. Make your own table and describe it.

Exercise 7. Make your own bar chart and describe it.

? Checklist

- What are the main rules for giving scientific information?
- How can you present your data?
- Give your opinion about effects of presentation figures to illustrate scientific papers.

UNIT 3
Theme: Structure of Scientific Papers

Wit & Wisdom: "All books are divisible into two classes: the books of the hour, and the books of all times." (John Ruskin – English author and art critic)

Exercise 1. Read and translate into Ukrainian. Discuss the following Introduction parts of the articles.

Introduction

To make the process of development of new cultivars faster it is essential to raise initial homogeneous material as quick as possible. The problem is even more exasperating for those crops where hybrids are more prevalent than varieties. Anther and microspore cultures are the key techniques to overcome this challenge, especially for Cruciferous crops, as they permit to reach full homozygosity in one generation [3]. In spite that many aspects of anther *in vitro*

response have already been investigated some issues are still understudied. One of the miss influences of light of different wave length on the morphogenesis *in vitro*. At the same time it is well known differentiated impact of rays of different wave lengths on that process *in vivo*. Although light is not usually considered to be necessary for the induction of androgenesis, for some species, like soybean [8] or *Citrus* [2], light of different quality was essential to produce morphogenic or embryogenic response.

The aim of our preliminary research was to study the action of rays of different spectral regions of visible light on the frequency of appearance of morphogenic structures and their type during cultivation of rapeseed anthers under artificial conditions.

Introduction

Brassica and cereal crops have been cultivated in Southeast Europe since Neolithic, as one of the major segments of the so-called “agricultural revolution”, having commenced in the Near East (Zoharyetal, 2012). The Balkan Peninsula as one of its main routes leading to the continent’s center and has remained oriented towards growing these crops until today. In many regions, spring-sown cultivars of both brassicas, such as rapeseed (*Brassica napus* L.) and white mustard (*Sinapis alba* L.), and cereals, like oat (*Avena sativa* L.), barley (*Hordeum vulgare* L.) and common wheat (*Triticum aestivum* L. subsp. *aestivum*) are used for forage production, either as sole crop soring mixtures mostly with annual legumes, such as pea (*Pisum sativum* L.) or common vetch (*Vicia sativa* L.) (Ćupinaetal, 2011, Ćupinaetal, 2014).

Intercropping, most often referring to sowing and cultivating two or more domesticated species at the same place and at the same time together, is one of the most ancient at tested farming designs (Hauggaard-Nielsen et al, 2011). Mixtures of brassicas and legumes proved to be beneficial to both components, especially for the first one, due to an enhanced supply with nitrogen (Cortés-Mora et al., 2010). The agronomic performance of the intercrops of various spring-sown brassicas and cereals has remained rather scarcely examined, although it could provide diverse agricultural practices in contrasting temperate environments with a number of advantages (Mihailović et al, 2014).

The goal of this study was to assess the possibility of intercropping spring-sown brassicas with cereals for green manure, thus examining its suitability for ecological services.

Introduction

Sunflower productivity per unit area largely depends on plant architecture. Plant architecture, in turn, depends on arrangement of leaves and their shape which is strongly correlated with the pattern of leaf venation (Denglar and Kang 2001). Moreover, major veins function in the import of water and minerals in the export of sugars, photosynthate, and in mechanical support, while the minor veins participate in

the local distribution and collection of water and soluble substances. The pattern of veins in a leaf can be used to help identify a plant (Haritatos et al. 2000; Cope et al. 2012).

It should be also noted that there exists an opinion that a high leaf vein density is one of the key properties of C4 plants. It has been considered as an initial step to the evolution of the C4 pathway in plant species (McKown and Dengder2009).

At present, the leaf venation patterns and their significance in plant life are poorly understood. The same can be said about the inheritance of the trait. Some research was conducted on studying leaf venation, for example, in *Prunus* hybrids (Okie and Rieger, 2003), several cereals (Hassan and Khaliq, 2008; Ahsan et al. 2013; Feldman et al. 2014; Shahid etal.1991), coffee (Mishraetal.2011).For sunflower, some data were earlier obtained on the inheritance of modified leaf. However, those authors did not supply enough data to talk about single or different venation types. Besides, they did not perform crossings between various venation types.

The present study analyses the inheritance of two patterns of leaf venation in sunflower which have been traditionally called ‘fan-nerved’.

Exercise 2. Read and translate into Ukrainian. Discuss the following Material and Methods parts of the articles.

Material and Methods

Two wild species, which are included in *Lunaria* L. genus, were used as initial material. One of these - *L. rediviva* - is characterized by perennial development type. The second species - *L. annua* - is annual plant. These two species were crossed with each other. The F_1 plants of *L. rediviva* x *L. annua* cross combination were self-pollinated and individually harvested. Resulted seeds were sown in boxes under controlled indoor conditions. After formation of 3-4 well-developed pairs of true leaves, the F_2 plants were visually examined for the presence of tubers on the roots. Simultaneously, the type of plant development was recorded, taking into account that by this time the annual plants of F_2 population started to bloom. Anatomy of root tubers was analyzed using light-microscope technique. The χ^2 test was used for comparison of the segregation observed with the theoretically expected ratio (Griffiths et al., 2004).

Materials and methods

Two sunflower genotypes with modified leaf venation were used as initial material. One of these was a mutant isolated in the M_2 generation of ZL-9 line treated with ethyl methanesulfonate (Lyakh, et al. 2005). The leaf veins in this mutant extend in a fan-shaped manner from the base of leaf blade at the point of their attachment to the petiole. The midrib is, as usual, more pronounced than all other veins. The first order (primary) veins are more pronounced and deviate at a more acute angle of 10-30° from the midrib in comparison to the control

(Fig. 1). Reticulate leaf venation is the norm for the parent line and the angle of deviation of the other primary veins from the midrib is 50° or more. The second mutation was isolated in the M3 generation following treatment of immature embryos of ZL-95 line with ethyl methanesulfonate (Soroka and Lyakh, 2009). This mutant does not have a clearly pronounced midrib. The major veins are located at a more acute angle in relation to each other than the central and lateral veins in the control parent (Fig. 1). Overgrowing the veins (raised veins) on the upper side (ad axial surface) of the leaf blade is another characteristic feature of this mutation. Leaf surface is rough and not smooth.

Both the parents' trains – ZL-9 and ZL-95 – were received from the Institute of Oilseed Crops, National Academy of Agricultural Sciences. They are characterized by reticulate leaf venation where the lateral veins, not reaching up to the edge of the leaf blade, are branched many times and their numerous branches interconnect to form a network of individual loops. The two mutant lines with different types of fan-nerved leaf venation were crossed with their respective parental lines and among themselves. The F_1 plants were controlled self-pollinated and individually harvested. After formation of well-developed true leaves, the F_2 plants were visually examined for the presence of mutant or normal venation trait. The fitness of the segregation observed to the theoretically expected ratio was subjected to the χ^2 test (Griffiths et al. 2004).

Material and methods

A small-plot trial was conducted during 2011 and 2012 at the Experimental Field of the Institute of Field and Vegetable Crops at Rimski Šančevi, including the sole crops and eight intercrops of two spring-sown brassicas and four spring-sown annual legumes. Since their well-known excellent standing ability, the rapeseed cv. Jovana and the white mustard cv. NS Gorica acted as the supporting crops for the pea (*Pisum sativum* L.) cv. Jantar, the common vetch (*Vicia sativa* L.) cv. Perla, the Narbonne vetch (*Vicia narbonensis* L.) line NG01 and the grass pea (*Lathyrus sativus* L.) cv. Sitnica, all rather prone to lodging and thus considered supported crops. In both growing seasons, all six sole crops and their eight intercrops sown in the first decade of March, at a double reduced rate in the intercrops than those in the sole crops: 20 viable seed sm^{-2} for rapeseed and white mustard, 50 viable seeds m^{-2} for pea and grass pea and 60 viable seeds m^{-2} for common and Narbonne vetches.

The sole crops of the brassicas were cut in full budding and the very beginning of flowering, while the sole crops of the annual legumes were cut in the stages of full bloom and first pods. The intercrops were cut when either a brassica or an annual legume component first reached these optimum stages for cutting.

Based upon aboveground biomass dry matter yield and aboveground biomass dry matter nitrogen proportion, determined with the standard method by Kjeldahl, aboveground biomass nitrogen yield (kg ha^{-1}) was calculated in all six

sole crops and their eight intercrops. The land equal entratio (LER) for aboveground biomass nitrogen yield was calculated by means of the following formula (Mikić et al. 2014):

$$LER = BIC / BSC + LIC / LSC,$$

with BIC as the aboveground biomass nitrogen yield of a brassica component in an intercrop, BSC as the aboveground biomass nitrogen yield of a brassica component in its sole crop, LIC as the aboveground biomass nitrogen yield of a legume component in an intercrop and LSC as the aboveground biomass nitrogen yield of a brassica component in its sole crop.

The obtained results were processed by analysis of variance (ANOVA) applying the Least Significant Difference (LSD) test.

Exercise 3. Read and translate into Ukrainian. Discuss the following Results and Discussion parts of the articles.

Results and Discussion

Numerous significant differences in two-year average aboveground biomass nitrogen yield in both intercrops and sole crops, as well as in the two-year average values of LER, were observed (Table1).

In the sole crops of spring-sown forage brassicas and annual legumes, the highest two-year average aboveground biomass nitrogen yield varied between 171 kg ha^{-1} in both rapeseed and Narbonne vetch and 327 kg ha^{-1} in grass pea. The white mustard cultivar NS Gorica had much better performance in comparison to the results of a preliminary testing of a series of forage white mustard lines in the same agroecological conditions, with an average aboveground biomass nitrogen yield of 90 kg ha^{-1} (Krstić et al. 2010).

The average two-year average values of total aboveground biomass nitrogen yield in the intercrops of spring-sown forage brassicas and annual legumes ranged from 178 kg ha^{-1} in the intercrop of white mustard and Narbonne vetch and 352 kg ha^{-1} in the intercrop of white mustard and grass pea. The components of this intercrop had the highest and the lowest two-year average individual contribution to the total aboveground biomass nitrogen, with 306 kg ha^{-1} in grass pea and 46 kg ha^{-1} in white mustard, respectively.

All eight intercrops of spring-sown forage brassicas and annual legumes had the average two-year values of LER higher than 1, thus proving their economic reliability, especially in the cases of intercropping rapeseed with pea and rapeseed with common vetch (both 1.23).

Results and Discussion

In both sole crops and intercrops of autumn-sown forage brassicas and annual legumes, there were significant differences in two-year average values of

aboveground biomass nitrogen yield and LER (Table1).

The highest two-year average aboveground biomass nitrogen yield in the sole crops of autumn-sown forage brassicas and annual legumes ranged from 189 kg ha^{-1} in rapeseed to 307 kg ha^{-1} in hairy vetch. The two-year average aboveground biomass nitrogen yield in the sole crop of the fodder kale cultivar Perast was somewhat higher than in a previously conducted trial with ten fodder kale cultivars and lines in the same environment, with 183 kg ha^{-1} (Ćupina et al.2010).

Among the intercrops of autumn-sown forage brassicas and annual legumes, the average two-year values of total aboveground biomass nitrogen yield varied between 162 kg ha^{-1} in the intercrop of rapeseed and Hungarian vetch and 319 kg ha^{-1} in the intercrop of rapeseed and hairy vetch. The highest two-year average individual contribution to the total aboveground biomass nitrogen yield was in hairy vetch (253 kg ha^{-1}), when intercropped with rapeseed, while the lowest two-year average individual contribution to the total aboveground biomass nitrogen yield was in rapeseed (67 kg ha^{-1}), when intercropped with hairy vetch.

Not all the intercrops had the average two-year values of LER higher than 1, with the intercrops of rapeseed and hairy vetch (1.18) and fodder kale with hairy vetch (1.13) as the most economically reliable.

Exercise 4. Read and translate into Ukrainian. Discuss the following Conclusions parts of the articles.

Conclusion

It was clearly demonstrated that the spring-sown intercrops of forage brassicas with annual legumes have a considerable ability to produce high aboveground biomass nitrogen yield in a relatively brief period, confirming their place in various crop rotations. The presented results also offer a solid basis for considering a possibility of developing cultivars of forage brassicas specifically for green manure.

Conclusions

There is a solid basis to deem intercropping field mustard with autumn-sown legumes and cereals reliable, in terms of both fresh forage yield and the economic aspect of such production, especially significant in feeding milk cows. The future research efforts should be focused on the quality aspects and stress-related issues.

Conclusion

The effect of genotypes, culture medium and their interaction was found significant for percent response of culture medium and percent response of explants for induction of androgenic callus. The present result showed that M8 medium (B5 salt + 100 mg/lt sucrose + 1mg/lt 2,4-D + 1mg/lt NAA + 1mg/lt BAP) was found highest

responses for development of androgenic callus in tropical cauliflower. Coconut water had positive effect for induction of callus from anthers.

Exercise 5. Read and translate into Ukrainian. Discuss the following Abstracts of the articles.

Abstract

Haploid development technique in cauliflower has immense potentiality to accelerate hybrid breeding programme. The technology is being standardized on several Brassica species including cauliflower. However, this technology has not been undertaken in tropical Indian cauliflower before. Present study is conducted to understand the response of tropical cauliflower variety in anther culture. Two cauliflower varieties *i.e.* Sabour Agrim, a tropical Indian cauliflowe variety and Pusa Hybrid 2, and snowball type cauliflower variety planted in the Vegetable Research Farm, Bihar Agricultural University, Sabour, Bhagalpur in the year, 2014-15. A theirs were collected at uni-nucle a test age of pollen grain. Culture mediums were prepared using MS salt and Gamborg B5 salt. Percent response for callus induction from anthers was varied between the genotypes. Highest response (31.97%) was observed for the variety Sabour Agrim. Among eight types of culture media composition only five were responded for call us induction. M8 medium (B5 salt + 100g/lt sucrose + 1mg/lt 2,4-D + 1mg/lt NAA + 1mg/lt BAP) was found highest responses for development of androgenic callus in tropical cauliflower.

Abstract

The inheritance of two types of modified leaf venation which were called as fan-nerved venation was studied in the cultivated sunflower. Both types of modified venation were isolated in chemical mutagenesis experiments which were conducted earlier. A distinctive feature of one of the mutations is clear appearance of central rib while the second mutation lacks sit. The F_1 plants from crosses between those mutants and between the mutants and genotypes with reticulate leaf venation had the usual reticulate leaf venation of sunflower (the wild type). The test of allelism, thus, demonstrates that the venation in the induced mutations is controlled by a gene (or genes) different from the gene causing the other venation phenotype. The F_2 segregated into four phenotypic classes of leaf venation: reticulate, two groups of both types of modified venation, and plants with the two modified venation types combined in the ratio of 9 reticulate (double dominant phenotype): 3 fan-venation type 1: fan-venation type 2: 1 combined fan-venation (double recessive homozygotes). It is concluded that two non-allelic recessive genes with complementary interaction are involved in the genetic control of fan-nerved leaf venation, and reticulate venation was determined by a combination of at least two dominant alleles of these genes. The gene symbols proposed are *vf1* and *vf2*.

Keywords: Sunflower, leaf venation, inheritance, two-gene control

Exercise 6. Read and translate into Ukrainian. Discuss the following examples of References of the articles.

References

Beil G.M., Atkins R. E. (1965) Inheritance of quantitative characters in grain sorghum. Jowa J Sci. **39**: 345-348.

Boyka O. (2014) Differences in plant development of *Lunaria* species. Materials of Lomonosov-2014: XXI International science conference. Biological section. 7-12 April 2014. Moscow. RF. MGU: 67

Cook C., Barnett J., Coupland K., Sargent J. (1998) Effects of Feeding *Lunaria* Oil Rich in Nervonic and Erucic Acids of the Fatty Acid Compositions of Sphingomyelins from Erythrocytes, Liver, and Brain of the Quaking Mouse Mutant. Lipids. **33**:993-1000.

Coombes, Allen J. (2012). *The A to Z of plant names*. USA: Timber Press. p. 312. ISBN 978-1-60469-196-2.

References

1. Soltis PS, Soltis DE: The role of hybridization in plant speciation. Ann Rev Plant Biol 2009, 60:561-588.

2. Wood TE, Takebayashi N, Barker MS, Mayrose I, Greenspoon PB, Rieseberg LH: The frequency of polyploid speciation in vascular plants. Proc Natl Acad Sci USA 2009, 106(33):13875-13879.

3. Cui L, Wall PK, Leebens-Mack JH, Lindsay BG, Soltis DE, Doyle JJ, Soltis PS, Carlson JE, Arumuganathan K, Barakat A, et al: Widespread genome duplications throughout the history of flowering plants. Genome Res 2006, 16(6):738-749.

4. Soltis DE, Albert VA, Leebens-Mack J, Bell CD, Paterson AH, Zheng CF, Sankoff D, dePamphilis CW, Wall PK, Soltis PS: Polyploidy and angiosperm diversification. Am J Bot 2009, 96(1):336-348.

5. Leitch AR, Leitch IJ: Genomic plasticity and the diversity of polyploid plants. Science 2008, 320(5875):481-483.

6. Jones RN, Hegarty M: Order out of chaos in the hybrid plant nucleus. Cytogenet Genome Res 2009, 126(4):376-389.

7. Doyle JJ, Flagel LE, Paterson AH, Rapp RA, Soltis DE, Soltis PS, Wendel JF: Evolutionary genetics of genome merger and doubling in plants. Ann Rev Genet 2008, 42:443-461. 8. Hemleben V, Zentgraf U: Structural organisation and regulation of transcription by RNA polymerase I of plant nuclear ribosomal genes. In Results and problems in cell differentiation 20: Plant promoters and transcription factors. Edited by: Berlin LN. Heidelberg: Springer-Verlag; 1994:3-24.

9. Neves N, Delgado M, Silva M, Caperta A, Morais-Cecilio L, Viegas W: Ribosomal DNA heterochromatin in plants. Cytogenet Genome Res 2005, 109(1-3):104-111.

? Check list

- What are the main parts of the study?
- What types of scientific articles do you know?
- How can you present your references?

UNIT 4
Theme: Scientific Articles

Wit & Wisdom: "Education has for its object the formation of character." (Herbert Spencer – English philosopher, biologist, anthropologist, sociologist, and prominent classical liberal political theorist)

Exercise 1. Read and translate into Ukrainian the following issues.

Cardamine occulta, the correct species name for invasive Asian plants previously classified as *C. flexuosa*, and its occurrence in Europe

Karol Marhold[1,2], Marek Šlenker[2], Hiroshi Kudoh[3], Judita Zozomová-Lihová[2]

1 *Department of Botany, Faculty of Science, Charles University, Benátská 2, CZ-128 01 Praha 2, Czech Republic* **2** *Institute of Botany, Slovak Academy of Sciences, Dúbravská cesta 9, SK-845 23 Bratislava, Slovakia* **3** *Center for Ecological Research, Kyoto University, Hirano 2-509-3, Otsu 520-2113, Japan*

Corresponding author: *Karol Marhold* (karol.marhold@savba.sk) Academic editor: *P. de Lange* | Received 21 January 2016 | Accepted 2 March 2016 | Published 25 March 2016

Citation: Marhold K, Šlenker M, Kudoh H, Zozomová-Lihová J (2016) *Cardamine occulta*, the correct species name for invasive Asian plants previously classified as *C. exuosa*, and its occurrence in Europe. Phyto Keys 62: 57–72. doi: 10.3897/ phytokeys.62.7865

Abstract

The nomenclature of Eastern Asian populations traditionally assigned to *Cardamine exuosa* has remained unresolved since 2006, when they were found to be distinct from the European species *C. exuosa*. Apart from the informal designation "Asian *C. exuosa*", this taxon has also been reported under the names *C. exuosa* subsp. *debilis* or *C. hamiltonii*. Here we determine its correct species name to be *C. occulta* and present a nomenclatural survey of all relevant species names. A lectotype and epitype for *C. occulta* and a neotype for the illegitimate name *C. debilis* (replaced by *C. exuosa* subsp. *debilis* and *C. hamiltonii*) are designated here. *Cardamine occulta* is a polyploid weed that most likely originated in Eastern Asia, but it has also been introduced to other continents, including Europe. Here data is presented on the rest records of this invasive species in European countries. e rest known record for Europe was made in Spain in 1993, and since then its occurrence has been reported from a number of European countries and regions as growing in irrigated

anthropogenic habitats, such as paddy elds or ower beds, and exceptionally also in natural communities such as lake shores.

Keywords

Asian *Cardamine exuosa*, Brassicaceae, *Cardamine exuosa* subsp. *debilis*, *Cardamine hamiltonii*, *Cardamine occulta*, China, Cruciferae, Europe, invasive species, typication

Introduction

Cardamine exuosa (Cruciferae) was described by Withering (1796) from the locality "Rookery at Edgbaston" in England. Recently, this name was lectotypied by Post et al. (2009) by the illustration (Fascicle. 4, Table no. 48, alternatively numbered no. 277) in Curtis' *Flora Londinensis or, plates and descriptions of such plants as grow wild in the environs of London* (1781). Schulz (1903), in his monograph of the genus *Cardamine*, treated *C. exuosa* in a wide sense with a number of subspecies, varieties and forms. Out of the infraspecic taxa recognized by Schulz (1903), *C. scutata* unb., *C. fallax* (O.E. Schulz) Nakai and *C. pennsylvanica* Willd. are now generally recognized as separate species. e remaining part of *C. exuosa* had until recently been treated as a single species distributed worldwide without the recognition of any infraspecic taxa (Jalas and Suominen 1994, Zhou et al. 2001, Al-Shehbaz et al. 2006).

It was not until the phylogenetic paper by Lihová et al. (2006) that it was realized that European and Eastern Asian populations traditionally treated as *C. exuosa* belong to two different taxa. Both DNA sequence and chromosome number data demonstrated that they represent two distinct evolutionary lineages. While the native European species *C. exuosa* is tetraploid (2n = 32, Marhold 1994, Kučera et al. 2005), Eastern Asian plants, informally treated by Lihová et al. as "Asian *C. exuosa*", are octoploid (2n = 64, Lihová et al. 2006, T. Mandáková, Brno, unpublished data, Marhold et al., unpublished data, contrary to the assumed hexaploid level based on owcytometric evidence by Bleeker et al. 2008). Multiple hypotheses about the parentage of tetraploid European *C. exuosa* have been put forward, invoking both auto- and allopolyploidy (reviewed by Lihová et al. 2006 and Mandáková et al. 2014). Only recently, the cytogenetic approach (combining genomic *in situ* hybridization and comparative chromosome painting, CCP/GISH) provided unequivocal evidence that this taxon is an allopolyploid originating from the diploids *C. amara* L. and *C. hirsuta* L. (Mandáková et al. 2014). In turn, CCP/GISH (Mandáková et al., in prep.) revealed allopolyploidy also in Eastern Asian *C. exuosa* (as inferred earlier from molecular data, Lihová et al. 2006), but with a different parentage. rear distinct diploid genomes were identified within this octoploid, corresponding to *C. amara*, *C. parviora* L. (or perhaps their unknown close relatives) and another, as yet unidentified taxon.

Morphological characters of Eastern Asian populations treated as *C. exuosa* and their differences from European populations are presented by a number of authors (e.g., Rosenbauer 2011, Hepenstrick and Hoer-Massard 2014, Dirkse et al. 2015). Most of their descriptions, however, do not encompass the whole variation of the two taxa, and none consider differences from other Asian relatives, such as *C.*

scutata, so a thorough morphometric study of *C. exuosa* and related Eastern Asian taxa is required (Marhold et al. in prep.). see two taxa also show considerable differences in their ecological requirements. European *C. exuosa* occurs mostly in forest plant communities along wet forest roads or in various open habitats and is only seldom found as a weed in ower beds (often introduced with mulch of bark chips) or in greenhouses (Kudoh et al. 2006). Eastern Asian *C. exuosa*, by contrast, is primarily a weed of rice paddy elds, and perhaps only secondarily occurs in other open habitats (Kudoh et al. 1993, Yatsu et al. 2003). It was hypothesized by Lihová et al. (2006) that the origin and spread of this latter taxon are associated with the establishment of suitable man- made habitats (e.g. paddy elds). Based on morphology and molecular data, Lihová et al. (2006) reported Eastern Asian *C. exuosa* from Japan, China, Taiwan, Thailand, Vietnam, Australia, Canada, USA and Mexico.

As a consequence, based on their genetic divergence, different ploidy, allopolyploid origins, morphology, ecological requirements and distribution patterns, we are of the opinion that European and Eastern Asian populations previously treated as *C. exuosa* should be classified as two different taxa at the species level. e concept of two taxa is also adopted in the Flora of North America (Al-Shehbaz et al. 2010) and is followed by other authors reporting plants corresponding to Eastern Asian *C. exuosa* from different parts of the world, particularly Europe. Several names have been used for this taxon, namely *C. exuosa* subsp. *debilis* O.E. Schulz (e.g., Rankin Rodríguez and Greuter 2009, Lazzeri et al. 2013, Ardenghi and Mossini 2014, Hohla 2014a, b), *C. hamiltonii* G. Don (e.g., Bomble 2014, Ardenghi et al. 2015, Dirkse et al. 2015, Hohla 2015) [both replacement names based on illegitimate *C. debilis* D. Don (non *C. debilis* Banks ex DC.)] and *C. occulta* Hornem. (Klinkenberg 2015).

None of the above-mentioned names were properly typified or used unequivocally, which necessitated a thorough search for the correct species-level name for "Asian *Cardamine exuosa*". Here we present a nomenclatural survey of all relevant names and highlight the increasing number of records of "Asian *Cardamine exuosa*" across Europe.

Materials and methods

For the purpose of typifying names, herbarium specimens, especially types and authentic collections, were searched for in relevant herbaria (B, BM, C, E, KW, LINN, P, TI and UPS), and prologues were studied in relevant publications. Bibliographical citations in databases, such as IPNI (e International Plant Names Index; www.ipni. org), Tropicos (www.tropicos.org) and e Plant List (www.theplantlist.org), were also checked, and for species, links to IPNI LSID metadata are provided. In cases when specimen images were available online, stable identifiers for specimens (Hyam et al. 2012, Güntsch and Hagedorn 2013, Hagedorn et al. 2013; herbaria B, SAV), other permanent links (herbarium P) or links via JSTOR Global Plants (https://plants.jstor. org/; herbarium KW) are provided. In designating types of names of taxa, we strictly followed the International Code of Nomenclature for algae, fungi, and plants (Mc- Neill et al. 2012). We also surveyed all relevant literature sources and gathered the rest records of "Asian *C. exuosa*" in European countries and their larger administrative divisions.

Results and discussion

Nomenclature

The type status of species names corresponding to "Asian *C. exuosa*" in the sense of Lihová et al. (2006) has been determined, and justifications for their typications are presented. *Cardamine occulta* is the oldest name applicable to populations of "Asian *C. exuosa*".

Cardamine occulta Hornem., Suppl. Hort. Bot. Hafn.: 71. 1819 (urn:lsid:ipni.org:names:280533-1:1.2) ≡ ***Cardamine exuosa* var. *occulta*** (Hornem.) O.E.Schulz, Bot. Jahrb. Syst. 32: 479 (1903) (http://biodiversitylibrary.org/page/185332). Described from: "*Hab.* in China. C. intr. 1817". **Lectotype (designated here, or perhaps holotype)**: *Cardamine occulta* mihi, sponte provenit in terra e China al[l]ata, ex h. b. Hafn. *Hornemann s.n.* – C! (ex herb. Hornemann, C10021749). Epitype (designated here): China, Zhejiang Province, Linhai County, Kuocang Mountains (括苍山), ditch along the road, 28°50.35'N; 120°58.90'E, 79 m, 18 April 2014, *K. Marhold CH18/12/2014, Yunpeng Zhao* 赵云鹏, *& Ming Jiang* 蒋明 – SAV! (SAV0006529 [http://ibot.sav.sk/herbarium/object/SAV0006529]).

There is a single specimen available in herbarium C originating from Hornemann's collection that undoubtedly represents the single remnant of the original material for the name *C. occulta*. As Hornemann (1819) referred to the specimen in the garden and not to the herbarium sheet, and as we cannot exclude that there was originally more than one specimen of this taxon in his collection, we designate the specimen as a lectotype of the name *C. occulta* (admitting that the specimen might well represent the holotype). e plant on the type herbarium sheet was apparently grown from seeds at the Copenhagen Botanical Garden ("ex h[ortus] b[botanicus] Hafn[iensis]"). Perhaps cultivation at the garden might be the reason why the specimen cannot be reliably and unequivocally identified as "Asian *C. exuosa*" for the purposes of the precise application of the name *C. occulta* to this taxon (especially considering the occurrence of a number of closely related taxa in China; Zhou et al. 2001). therefore, in order to x the application of the name *C. occulta*, we designate here an epitype of this name from a cytogenetically investigated population from Eastern China with a known chromo- some number (2n = 64; Mandáková et al., in prep.).

= *Cardamine debilis* D. Don, Prodr. Fl. Nepal. 201. 1825 [26 Jan-1 Feb 1825], (urn:lsid:ipni.org:names:280260-1:1.3; http://biodiversitylibrary.org/page/393098), nom illeg., non Banks ex DC. Syst. Nat. 2: 265. 1821 [late May 1821] (urn:lsid:ipni.org:names:280259-1:1.4; http://biodiversitylibrary.org/page/39512107). Described from: "*Hab.* in Nepaliâ ad Narainhetty. *Hamilton*." **Neotype (designated here)**: [India, West Bengal] Botanical Garden Darjeeling, weed, 18. 6. 1959, *Lövkvist C-336- 3* – UPS! (GUID UPS:BOT:V-194865) ≡ ***C. hamiltonii*** G. Don, Gen. Hist. 1: 167. 1831 [early Aug 1831] (urn:lsid:ipni.org:names:280357-1:1.2.2.1.1.1; http://biodiversitylibrary.org/page/389972) ≡ ***C. exuosa* subsp. *debilis*** O.E. Schulz, Bot. Jahrb. Syst. 32: 478. 1903 (http://biodiversitylibrary.org/page/185331).

The name *C. debilis* D. Don is based on data in the manuscript of Francis Buchanan-Hamilton (referred to as "Hamilton MSS"; Don 1825: 201), and it is unclear whether D. Don studied any specimen collected by Buchanan-Hamilton. Although Hara and Williams (1979) mentioned the type of *C. debilis* [when indicating

localities of *C. scutata* subsp. *exuosa* (With.) Hara in Nepal], in Shrestha and Press (2000), the type specimen is listed as “not found”. In any case, a thorough search in the herbaria BM, E, LINN-Smith (Roy Vickery, John Edmondson, Mark Watson, personal com- munication) did not reveal any original material of this name. ere is a specimen cor- responding to the description of *C. debilis* D. Don and to “Asian *C. exuosa*”, collected in the neighbouring area of West Bengal, with a chromosome number counted by B. Lövkvist (2n = 64, unpublished data, deposited at UPS). is specimen is selected here as a neotype to x the application of the name.

= *Cardamine brachycarpa* Franch., Bull. Soc. Bot. France 26: 83. 1879, nom. illeg. (urn:lsid:ipni.org:names:280196-1:1.4; http://biodiversitylibrary.org/page/260368), non Opiz, Naturalientausch 11: 411. 1826 (urn:lsid:ipni.org:names:280195-1:1.3). Described from: [JAPAN] “Insul. Nippon, prov. Etchigo, circa Niigata, secus vias humi- das(R.P.Faurie)”.Lectotype(designatedbyMarholdetal.2015:11):[JAPAN,Prefec- ture Niigata], “Nippon, Niigata, secus vias, *[U. J.] Faurie 23*” – P! (P00747512 [http:// coldb.mnhn.fr/catalognumber/mnhn/p/p00747512]); Isolectotype – P! (P00747513 [http://coldb.mnhn.fr/catalognumber/mnhn/p/p00747513]) ≡ ***C. koshiensis*** Koidz., Fl. Symb. Orient.-Asiat. 43. 1930 (urn:lsid:ipni.org:names:280422-1:1.2.1.2).

= *Cardamine arisanensis* Hayata, Icon. Pl. Formosan. 3: 20. 1913 [25 Dec 1913] (urn:lsid:ipni.org:names:280161-1:1.3). Described from: “In Monte Morrison, ad 10000-11000 ped. alt., leg. T.Kawakami et U.Mori, 1906, Oct. (No.2252); in Monti- bus Centralibus, Feb. 1908”. Lectotype (Ohwi 1934: 50, see also Al-Shehbaz and Peng 2000: 237): [TAIWAN] “Kagi, Arisan (Chiayi, Alishan), Taiwan Sotoku- fu, Industry Bureau, Plant Specimens, no. 3631, 25 March 1908, *T. Kawakami & S. Mori s.n.*” (TI) ≡ ***Barbarea arisanense*** (Hayata) S.S.Ying, Alp. Pl. Taiwan in Color 2: 170. 1978.

= ***Cardamine autumnalis*** Koidz. Bot. Mag. (Tokyo) 43: 404. 1929 (urn:lsid:ipni. org:names:280169-1:1.3) – Described from: “Nippon: Yokosuka (1g. Wichura, Oct. 18, 1860) Mus. Bot. Berol.-Dahlem”. Holotype: “Japan, Jokohama, 19. [sic!] 10. 1860, *[M. E.] Wichura 1064 [1069?]*” B! (B 10 0241388 [http://herbarium.bgbm.org/ object/B100241388]).

The species *C. autumnalis* was described with a reference to “*Cardamine exu- osa* ssp. *debilis* Schultz (pro. parte) in Engl. Bot. Jahrb. 32. (1903) s. 479, (quoad specim. ex Yokoska)”. Indeed, there is a specimen marked “Japonia: ... pr. Jokohama leg. Wichura 1860” referred to by Schulz (1903: 479) as *Cardamine exuosa* subsp. *debilis* deposited in B. e specimen bears a revision label by Schulz with the name “*Cardamine exuosa* With. subspec. *debilis* Don var. *occulta* (Hornem.) O. E. Sch.”, dated 25. 4. 1902. Although this specimen was identi ed by Schulz as var. *occulta*, it should be noted that there is no specimen referred to by Schulz (1903: 480) identi ed as *Cardamine exuosa* subsp. *debilis* var. *occulta* from Japan.

e usual life cycle of *C. occulta* in Eastern Asian rice elds includes owering in early spring before rice is planted and the elds are ooded by water. Nevertheless, there are also exceptions such as the nomenclatural type of the name *C. autumnalis*, which represents an autumn- owering plant of *C. occulta*. Kudoh et al. (1993: g. 8) reported such plants from paddy elds in the autumns of years in which rice was not

cultivated (no water ooding during summer).

– ***Cardamine* a . *exuosa*** sensu I. omps., Flora of Victoria 3: 434–442. 1996. ere are two other names at the species level that are potentially applicable to

“Asian *C. exuosa*”, namely:

Cardamine nasturtioides D.Don, Prodr. Fl. Nepal.: 201. 1825. [26 Jan-1 Feb 1825] (urn:lsid:ipni.org:names:280509-1:1.3; http://biodiversitylibrary.org/page/393098) – Described from: “*Hab.* in Nepaliâ. *Hamilton*.”

Cardamine decurrens (Blume) Zoll. et Moritzi in Moritzi, Syst. Verz.: 35. 1846 (ur- n:lsid:ipni.org:names:280262-1:1.3.2.2; http://reader.digitale-sammlungen.de/de/fs1/object/display/bsb10302557_00051.html) ≡ *Pteroneurum decur- rens* Blume, Bijdr. Fl. Ned. Ind. 2: 51. 1825 [12 Jun-2 Jul 1825] (urn:lsid:ipni.org:names:288262-1:1.1.2.2.1.2; http://biodiversitylibrary.org/page/428177). – Described from: “in altis paludosis montis Burangrang Provinciae Krawang.”

The location of the original material of these two names is as yet unknown, and it remains to be ascertained whether they are synonyms of *C. occulta* or represent other taxa. In any case, both these names are later than *C. occulta*, which has priority among all species names applicable to “Asian *C. exuosa*”.

The name *C. zollingeri* Turcz. was sometimes considered to be a synonym of *C. exuosa* in a wide sense (e.g., Zhou et al. 2001, Al-Shehbaz et al. 2006, Al-Shehbaz and Watson 2012) or of *C. exuosa* subsp. *debilis* (Schulz 1903: 479). Nevertheless, it is morphologically di erent from both *C. exuosa* and *C. occulta* in the circumscriptions presented here and likely represents a separate taxon that requires further study:

Cardamine zollingeri Turcz., Bull. Soc. Imp. Naturalistes Moscou 27(2): 294. 1854 (urn:lsid:ipni.org:names:280762-1:1.3)≡*Nasturtiumobliquum*Zoll.&Moritzi,Natu- ur- Geneesk. Arch. Ned.-Indië 2: 580. 1845 (urn:lsid:ipni.org:names:287528-1:1.4; https://archive.org/stream/natuurengeneesku02bata#page/580/mode/2up) – Described from: “[Java] *Nasturtium obliquum* Z. et M. Herb. N. 2211 ... Legi in arenosis et glareosis vulcanicis ad uviorum ripas e. g. prope *Trawas* prov. *Modjokerto* VIII.1844. p. m. 3000’ s. m.” **Lectotype (designated here)**: [INDONESIA, Java], “Planta Javanica a cl. Zolliger lecta no. 2211” *Zollinger 2211* KW! (KW001000851 [https://plants.jstor.org/stable/10.5555/al.ap.specimen.kw001000851]); Isolecto- type: P! (P00747614 [http://coldb.mnhn.fr/catalognumber/mnhn/p/p00747614]).

Occurrence of *Cardamine occulta* in Europe

Cardamine occulta most likely originated in Eastern Asia. It is unclear whether it natu- rally occurs or ever occurred in any natural plant community. e localities that we know from Japan and Eastern China and which are referred to on herbarium speci- mens represent solely man-made habitats, most often rice paddies, orchards or various other kinds of synanthropic vegetation. is is why we (Lihová et al. 2006) hypoth- esized that the origin and spread of this polyploid species might have been connected with the occurrence of man-made habitats.

As stated above, Lihová et al. (2006) reported plants corresponding to *C. occulta* from Japan, China, Taiwan, ailand, Vietnam, Australia, Canada, USA and Mexico. Other previously published data corresponding to *C. occulta* than those that

were re- ferred to by Lihová et al. (2006) were the report of *C. debilis* D. Don from North America as an introduced weed (Rollins 1993) and *C.* a . *exuosa* from Australia (ompson 1996). Subsequently, this taxon was published also for Cuba (Rankin Rodríguez and Greuter 2009, as *C. exuosa* subsp. *debilis*).

When Lihová et al. (2006) suggested that European and Asian *C. exuosa* should be treated as separate taxa, no record corresponding to Asian *C. exuosa* plants was known from the European territory. Nevertheless, a number of records from Europe have been published since 2007, and we can trace the spreading of this invasive plant throughout the continent (see Table 1, Fig. 1). To the best of our knowledge, the earliest record of *C. occulta* from Europe dates back to 1993, when this species was collected in the Spanish province of Alicante and originally identi ed as *C. exuosa*. Its true taxonomic identity was, however, clari ed much later (Crespo et al. 2013). In 2007 the rst author of this paper received for identi cation a specimen collected in 2003 in a rice eld ditch in the province of Piedmont, Italy (Vercelli, Arborio) by Michel Desfayes (Fully, Switzerland). is specimen undoubtedly belongs to *C. occulta* and might have been introduced together with rice from Eastern Asia. From the same broad locality, the occurrence of this taxon was reported by omas Götz (a specimen collected in 2005, published by Dienst 2007) and more recently by Verloove and Ardenghi (2015; as *C. hamiltonii*).

The third spot in Europe where *C. occulta* was reported from are the shores of Lake Constance (Bodensee) in Germany. In spring 2004, an unknown *Cardamine* species was detected there at the Reichenau dam (observed by W. Ostendorp, M. Dienst and E. Klein; Dienst 2007). e identity of these plants was con rmed by DNA sequencing (Bleeker et al. 2008). Until 2007, 95 locations on the shores of Lake Constance had been known. Localities were found around the lake in Germany (Baden-Würt- temberg and Bavaria), Austria (Vorarlberg) and Switzerland (cantons Scha hausen, urgau, and St. Gallen; Bleeker et al. 2008). Bleeker et al. (2008) noted that *C. oc- culta* was more frequent on ne-grained and nutrient-rich sediments than on nutrient- poor gravel shores. It is likely that this species may change the community structure of ephemeral vegetation on bare and organic sediments.

Cardamine occulta was later reported also from continental Spain, the Canary Is- lands, France, parts of Germany, Switzerland and Austria other than the shores of Lake Constance, from Belgium, the Netherlands, Slovakia, and Crete (Table 1). It is nevertheless likely that the species is currently present, but still overlooked, also in other European countries. It should be noted that most records mentioned in Table 1 refer to urban vegetation. *Cardamine occulta* grows in ower beds and pots, at the edges of roads, among cobblestones or paving stones, or on pavements, often in irri- gated places. In most cases, it was apparently introduced as a weed, often with mulch, from plant nurseries where it nds appropriate growing conditions (as reported from North America by Post et al. 2011). However, the species was also found in rice elds in northern Italy, where it was most likely introduced with rice from Eastern Asia.

There are only a few known occurrences of *C. occulta* in European natural plant com- munities, and it seems that such reports are restricted to the surroundings of Lake Constance. Bleeker et al. (2008) hypothesized that this species might have been intro- duced to the lake from rice elds of northern Italy by migrating birds or

directly from Japan by tourists.

For most of the countries and administrative divisions presented in Table 1, only one or few localities of *C. occulta* are known. ere are numerous observational records of *C. occulta* from the Netherlands and Belgium in the databases presented at observa- tion.org, waarneming.nl and waarnemingen.be (referred to as *C. hamiltonii*), perhaps because botanists in these countries were encouraged to searched for it. Nevertheless, there are no voucher specimens documenting these data, and some of them are not even documented by photographs. According to the photographic documentation, some records are apparently based on misidenti cations of *C. hirsuta* and tetraploid *C. exuosa*. A number of photographic records document juvenile plants that are hard to identify reliably. For future mapping of the distribution of *C. occulta*, all records should be documented by vouchers deposited in public herbaria.

It is apparent that, unlike European *C. exuosa*, *C. occulta* represents an invasive species that is quickly spreading from its area of origin in Eastern Asia to other con- tinents. e characteristics of seed dormancy and germination of *C. occulta* are likely to enhance its invasiveness, especially in wet and occasionally submerged habitats. It has been reported that seeds of *C. occulta* can survive both in dry and submerged conditions for more than three months (Yatsu et al. 2003). e combination of seed dormancy in dry soil and dormancy release by submergence (Yatsu et al. 2003) is likely to enhance the transportation of *C. occulta* seeds with soils and the establishment of invasive populations in seasonally submerged habitats such as paddy eld, dams or lake shores and in regularly irrigated ower beds and other urban habitats. Diploid *C. hirsuta* is in fact another example of the invasive potential of *Cardamine* species. is species originated in Europe and is now widely distributed on all continents, particu- larly in drier conditions. e speed of its spreading can be illustrated on the example of the Japanese archipelago. While the rst record of this species for Japan dates to 1974 (Kudoh et al. 1992), already in 2006 it became a common roadside weed across most of Honshu Island, the main island of Japan, and was spreading also to Kyushu and Hokkaido Islands (Yatsu et al. 2003, Kudoh et al. 2007).

Acknowledgements

This work was supported by the Czech Science Foundation (P506/12/0668 to K.M.). e authors thank Dušan Senko, Bratislava for his help with the map and two reviewers for their constructive comments.

References

Al-Shehbaz IA, Arai K, Ohba H (2006) *Cardamine*. In: Iwatsuki K, Bou ord DE, Ohba H (Eds) Flora of Japan, vol. IIa, Angiospermae, Dicotyledoneae, Archichlamydeae(a). Kodansha Ltd., Tokyo, 482–490.

Al-Shehbaz IA, Marhold K, Lihová J (2010) *Cardamine* Linnaeus. In: Flora of North America Editorial Committee (Ed.) Flora of North America North of Mexico, vol. 7. Oxford Uni- versity Press, New York & Oxford, 464–484.

Al-Shehbaz IA, Peng ChI (2000) e genus *Barbarea* (Brassicaceae) in Taiwan. Botanical Bul- letin of Academia Sinica 41: 237–242. http://ejournal.sinica.edu.tw/bbas/content/2000/3/ bot13-10.html

Al-Shehbaz IA, Watson MF (2012) Flora of Nepal. Cruciferae. Webedition 1.

http://data.rbge. org.uk/publications/FloraofNepal/library/Cruciferae/1 [accessed 5. 12. 2015]

Ardenghi NMG, Cauzzi P, Galasso G (2015) *Cardamine hamiltonii* G. Don. In: von Raab- Straube E, Raus T (Eds) Euro+Med-Checklist Notulae, 4. Willdenowia 45: 121–122. doi: 10.3372/wi.45.45113

Ardenghi NMG, Mossini S (2014) *Cardamine exuosa* subsp. *debilis* O. E. Schulz. In: von Raab-Straube E, Raus T (Eds) Euro+Med-Checklist Notulae, 3. Willdenowia 44: 292. doi: 10.3372/wi.44.44211

Bleeker W, Klausmeyer S, Peintinger M, Dienst M (2008) DNA sequences identify invasive al- ien *Cardamine* at Lake Constance. Biological Conservation 141: 692–698. doi: 10.1016/j. biocon.2007.12.015

Bomble FW (2014) Japanisches Reisfeld-Schaumkraut (*Cardamine hamiltonii*) in Aachen. [Japanese rice eld Bitter-cress (*Cardamine hamiltonii*) in Aachen (North Rhine-West- phalia, Germany)]. Verö entlichungen des Bochumer Botanischen Vereins 6: 1–5. http:// nbn-resolving.de/urn/resolver.pl?urn:nbn:de:hebis:30:3-354651

Crespo MB, Azorín MM, Camuñas E (2013) Novedades corológicas para la ora valenciana [New records for the ora of the Valencian Community (E of Spain)]. Flora Montiberica 55: 118–127. http://hdl.handle.net/10045/33135

Curtis W (1781) Flora Londinensis: or Plates and Descriptions of Such Plants as Grow Wild in the Environs of London, vol. 2, fascicle 4, number 38. London.

Dienst M (2007) Cardamine-Neophyt im Bodensee-Litoral – wer kennt weitere Fundorte? http://www.wildblumen.net/BAS/module/wordpress/?p=52 [accessed 11.12.2015]

Dirkse GM, Zonneveld BJM, Duistermaat LH (2015) *Cardamine hamiltonii* G. Don - Aziatische veldkers (Brassicaceae) in Nederland. Gorteria 47: 64–69.

Don D (1825) Prodromus orae Nepalensis : sive Enumeratio vegetabilium quae in itinere per Nepaliam proprie dictam et regiones conterminas, ann. 1802–1803. Detexit atque legit d. d. Franciscus Hamilton, (olim Buchanan) Accedunt plantae a. d. Wallich nuperius missae. J. Gale, London, 1–256.

Güntsch A, Hagedorn G (2013) Stable identi ers for specimens – A CETAF ISTC initiative supported by pro-iBiosphere. http://www.pro-ibiosphere.eu/news/4296_stable%20identi- ers%20for%20specimens%20-%20a%20cetaf%20istc%20initiative%20supported%20 by%20pro-ibiosphere/ [accessed 11.12.2015]

Hagedorn G, Catapano T, Güntsch A, Mietchen D, Endresen D, Sierra S, Groom Q, Biserkov J, Glöckler F, Morris R (2013) Best practices for stable URIs. http://wiki.pro-ibiosphere. eu/wiki/Best_practices_for_stable_URIs [accessed 11.12.2015]

Hara H, Williams LHJ (1979) An Enumeration of the Flowering Plants of Nepal, vol. 2. British Museum (Natural History), London, 1–220.

Hepenstrick D, Ho er-Massard F (2014) Un xénophyte asiatique du groupe *Cardamine exuosa*: identi cation, nomenclature et génétique. Bulletin du Cercle vaudois de botanique 43: 69–76. http://pd.zhaw.ch/publikation/upload/207561.pdf

Hohla M (2012) *Bromus sitchensis* – neu für Österreich, *Plantago coronopus* -

neu für Oberöster- reich sowie weitere Beiträge zur Kenntnis der Flora des Innviertels. Stap a 97: 180–192. http://www.zobodat.at/pdf/STAPFIA_0097_0180-0192.pdf

Hohla M (2014a) Beiträge zur Kenntnis der Flora von Bayern IV. Berichte der Bayerischen Botanischen Gesellschaft zur Erforschung der heimischen Flora 84: 91–100.

Hohla M (2014b) *Hystrix patula* – neu für Österreich, sowie weitere Beiträge zur Flora von Oberösterreich, Salzburg, Steiermark und Vorarlberg. Stap a 101: 83–100.

Hohla M, Diewald W, Király G (2015) *Limonium gmelini* – eine Steppenp anze an öster- reichischen Autobahnen sowie weitere Neuigkeiten zur Flora Österreichs. Stap a 103: 127–150. http://www.zobodat.at/pdf/STAPFIA_0103_0127-0150.pdf

Hornemann JW (1819) Supplementum Horti botanici hafniensis. Typis Schultzii, Hafniae, 1–172.

Hyam RD, Drinkwater RE, Harris DJ (2012) Stable citations for herbarium specimens on the internet: an illustration from a taxonomic revision of *Duboscia* (Malvaceae). Phytotaxa 73: 17–30. doi: 10.11646/phytotaxa.73.1.4

Jalas J, Suominen J (Eds) (1994) Atlas Florae Europaeae. Distribution of Vascular Plants in Europe, vol. 10. Committee for Mapping the Flora of Europe and Societas Biologica Fennica Vanamo, Helsinki, 1–224.

Klinkenberg B (Ed.) (2015) E-Flora BC: Electronic Atlas of the Flora of British Columbia [e ora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, Universi- ty of British Columbia, Vancouver, http://ibis.geog.ubc.ca/biodiversity/e ora/ [accessed 03.12.2015]

Kučera J, Valko I, Marhold K (2005) On-line database of the chromosome numbers of the genus *Cardamine* (Brassicaceae). Biologia 60: 473–476. http://www.cardamine.sav.sk/www/index. php?lang=en

Kudoh H, Ishiguri Y, Kawano S (1992) *Cardamine hirsuta* L., a new ruderal species introduced into Japan. Journal of Phytogeography and Taxonomy 40: 85–89.

Kudoh H, Ishiguri Y, Kawano S (1993) Phenotypic variability in life history traits and phenology of eld populations of *Cardamine exuosa* and *C. fallax* (Cruciferae) in Honshu, Japan. Plant Species Biology 8: 7–20. doi: 10.1111/j.1442-1984.1993.tb00229.x

Kudoh H, Marhold K, Lihová J (2006) Notes on *Cardamine impatiens* L., *C. exuosa* With., *C. hirsuta* L. and *C. parvi ora* L. in Japan. Bunrui 6: 41–49.

Kudoh H, Nakayama M, Lihová J, Marhold K (2007) Does invasion involve alternation of ger- mination requirements? A comparative study between native and introduced strains of an annual Brassicaceae, *Cardamine hirsuta*. Ecological Research 22: 869–875. doi: 10.1007/ s11284-007-0417-5

Cardamine occulta, the correct species name for invasive Asian plants... 71

Lazzeri V, Marhold K (2016) *Cardamine occulta* Hornem. (Brassicaceae). In: Galasso G, Domina G, Adorni M, Alessandrini A, Ardenghi NMG, Ban W, Bedini G, Bertolli A, Brundu G, Calbi M, Cecchi L, Cibei C, D'Antraccoli M, De Bastiani A, Faggi G, Ghillani L, Giardini M, Iberite M, Kleih M, Latini M, Lazzeri V, Liguori P,

Marhold K, Masin R, Mauri S, Meneguzzo E, Mereu G, Nicolella G, Olivieri N, Peccenini S, Perrino EV, Peruzzi L, Petraglia A, Pierini B, Prosser F, Roma-Marzio F, Romani E, Sammartino F, Selvaggi A, Signorile G, Stinca A, Verloove F, Nepi Ch. Notulae to the Italian Alien Vascular Flora 1. e Italian Botanist 1, in press.

Lazzeri V, Mascia F, Sammartino F, Campus G, Caredda A, Carlesi V, Fois M, Gestri G, Mannocci M, Mazzoncini V, Lombraña AC, Santinelli M (2013) Novità oristiche per le regioni Sardegna e Toscana. Acta Plantarum Notes 2: 42–59. http://www.actaplantarum.
org/ap_notes/pubbl/ActaPlantarum_Notes_2_dicembre_2013.pdf

Lihová J, Marhold K, Kudoh H, Koch MA (2006) Worldwide phylogeny and biogeography of *Cardamine exuosa* (Brassicaceae) and its relatives. American Journal of Botany 93: 1206–1221. doi: 10.3732/ajb.93.8.1206

Mandáková T, Marhold K, Lysak MA (2014) e widespread crucifer species *Cardamine ex- uosa* is an allotetraploid with a conserved subgenomic structure. New Phytologist 201: 982–992. doi: 10.1111/nph.12567

Mansanet-Salvador CJ, Ferrer-Gallego PP, Ferrando I, Laguna E (2015) Notas sobre el complejo taxonómico *Cardamine exuosa* With. (Cruciferae) y su presencia en la Co- munidad Valenciana. Flora Montiberica 59: 72–82. http://dialnet.unirioja.es/servlet/ oaiart?codigo=5123731

Marhold K (1994) Chromosome numbers of the genus *Cardamine* L. (Cruciferae) in the Car- pathians and Pannonia. Phyton (Horn, Austria) 34: 19–34. http://www.zobodat.at/stable/ pdf/PHY_34_1_0019-0034.pdf

Marhold K, Kempa M, Al-Shehbaz I (2015) Lectotypi cation of names of Himalayan Bras- sicaceae taxa currently placed in the genus *Cardamine*. PhytoKeys 50: 9–23. doi: 10.3897/ phytokeys.50.5080

McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Marhold K, Prado J, Prud'homme van Reine WF, Smith GF, Wiersema JH, Turland NJ (2012) International Code of Nomenclature for Algae, Fungi, and Plants (Mel- bourne Code). Adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011 [Regnum Vegetabile 154]. Koeltz Scienti c Books, Königstein, 240 pp.

Moritzi A (1845–1846) Systematisches Verzeichniss der von H. Zollinger in den Jahren 1842– 1844 auf Java gesammelten P anzen, nebst einer kurzen Beschreibung der neuen Gattun- gen und Arten. Druck von Fr. X. Zepfel, Solothurn, i-xii + 1–144.

Ohwi J (1934) Plantae novae Japonicae. Repertorium Specierum Novarum Regni Vegetabilis 36: 39–58.

Post AR, Krings A, Xiang QY, Sosinski BR, Neal JC (2009) Lectotypi cation of *Cardamine exuosa* (Brassicaceae). Journal of the Botanical Research Institute of Texas 3: 227–230. http://www.jstor.org/stable/41972157

Post AR, Ali R, Krings A, Xiang J, Sosinski BR, Neal JC (2011) On the identity of the Weedy Bittercresses (*Cardamine*: Brassicaceae) in United States nurseries: Evidence from molecules and morphology. Weed Science 59: 123–135. doi: 10.1614/WS-D-10-00063.1

Rankin Rodríguez R, Greuter W (2009) Brassicaceae. In: Greuter W, Rankin

Rodríguez R (Eds) Flora de la República de Cuba, serie A, Plantas Vasculares, Fascículo 15. AR Gantner Verlag KG, Ruggell, 1–51.

Rollins RC (1993) e Cruciferae of Continental North America. Stanford University Press, Stanford, 996 pp.

Rosenbauer A (2011) Ausgewählte *Cardamine*-Arten in Baden-Württemberg. Zentralstelle für die oristische Kartierung von Baden-Württemberg, Rosenstein, 1 p. http://www. ora. naturkundemuseum-bw.de/BestimmungCardamine.pdf

Schulz OE (1903) Monographie der Gattung *Cardamine*. Botanische Jahrbücher für Systematik, P anzengeschichte und P anzengeographie 32: 280–623.

Shrestha KK, Press JR (2000) Catalogue of Type Specimens from Nepal. Natural History Mu- seum, London, 123 pp.

ompson IR (1996) *Cardamine*. In: Walsh NG, Entwisle TJ (Eds) Flora of Victoria, vol. 3. Inkata Press, Melbourne, 434–442.

Verloove F (2013) New xenophytes from Gran Canaria (Canary Islands, Spain), with emphasis on naturalized and (potentially) invasive species. Collectanea Botanica 32: 59–82. doi: 10.3989/collectbot.2013.v32.006

Verloove F, Ardenghi NMG (2015) New distributional records of non-native vascular plants in northern Italy. Natural History Sciences. Atti della Societa Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano 2: 5–14. doi: 10.4081/nhs.2015.219

Verloove F, Gullón ES (2012) New records of interesting vascular plants (mainly xenophytes) in the Iberian Peninsula. II. Flora Mediterranea 22: 5–24. doi: 10.7320/FlMedit22.005

Verloove F, Reyes-Betancort JA (2011) Additions to the ora of Tenerife (Canary Islands, Spain). Collectanea Botanica 30: 63–78. doi: 10.3989/collectbot.2011.v30.007

Withering W (1796) An Arrangement of British Plants, vol. 3. Ed. 3. M. Swiney, Birmingham, 513–920.

Zhou TY, Lu LL, Yang G, Al-Shehbaz IA (2001) Brassicaceae. In: Wu ZY, Raven PH (Eds) Flora of China, vol. 8. Science Press & Missouri Botanical Garden Press, Beijing & St. Louis, 1–193.

Yatsu Y, Kachi N, Kudoh H (2003) Ecological distribution and phenology of an invasive species, *Cardamine hirsuta* L., and its native counterpart, *Cardamine exuosa* With., in central Japan. Plant Species Biology 18: 35–42. doi: 10.1046/j.1442-1984.2003.00086.x

Exercise 2. Explain the meaning of the following words. Read and translate them into Ukrainian.

Allopolyploid, unequivocally, relevant, typifying, specimen, occurrence, spot.

Exercise 3. Answer the following questions.

1. What was the object of the study?
2. What were the main methods?

3. What results were obtained by the authors?
4. What is the importance of this work from your point of view?

Exercise 4. Express your opinion on the research paper given above.

? Checklist

- What is the main idea of translation of the scientific papers?
- What is the most difficult part of the translation?
- Is the meaning of the words always the same in different fields of knowledge?

UNIT 5
Theme: Conference

Wit & Wisdom: "Fear always springs from ignorance." (Ralph Waldo Emerson – American poet and essayist)

Exercise 1. Study the following example of Poster. Read and translate it into Ukrainian.

HONESTY SPECIES AND THEIR INTERSPECIFIC HYBRIDS

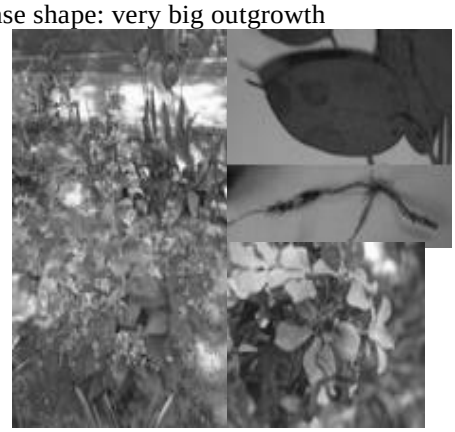
Olena Boyka, PhD student, assistant, Viktor Lyakh, professor, Doctor of biological sciences
Zaporizhzhya National University, Zaporizhzhya, Ukraine

Honesty – plant with a good ornamental look and rare fatty acid composition of oil.
Honesty belongs to *Brassicaceae* family.

Initial species

Lunaria annua L.
Type of development: annual
Leaf color: light-green
Leaf tip shape: narrow triangular
Leaf base shape: small outgrowth

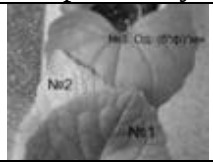
Lunaria rediviva L
Type of development: perennial
Leaf color: dark-green
Leaf tip shape: round
Leaf base shape: very big outgrowth

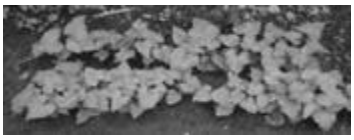


Cross-combinations

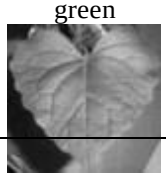
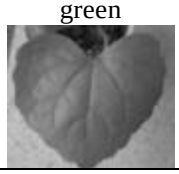
♀ L. rediviva (1)	♂ L. annua (2)
♀ L. annua (2)	♂ L. rediviva (1)

Interspecific hybrids

Comparing leaf color of interspecific hybrids with parental form		

	L. annua ×*L.rediviva*	*L. rediviva* × *L.annua*
F2 generation of interspecific hybrids (summer of the 1 year		

Some morphological traits

Genotype / Trait	*L. annua*	*L. rediviva*	*L. annua* × *L. rediviva*	*L. rediviva* × *L. annua*
Leaf color	light-green 	dark-green 	green 	green 

Exercise 2. Study the following example of Abstracts for the conference participation. Read and translate it into Ukrainian.

Honesty species and their interspecific hybrids

Olena Boyka, PhD student, assistant,
Viktor Lyakh, professor, Doctor of biological sciences
Zaporizhzhya National University, Zaporizhzhya, Ukraine

Nowadays, it's very important to broaden an assortment of species which can be used for human's needs. Some plants are perspective in multiuse. One of those crops is honesty (*Lunaria* genus) from *Brassicaceae* family. This plant has a good ornamental look and rare fatty acid composition of oil.

Two species of honesty are known. They have differences, firstly, in a plant development type. *Lunaria annua* L. is an annual species while *Lunaria rediviva* L. is characterized by perennial type of development. This two honesty species have different terms of flowering and doesn't produce interspecific hybrids under the natural condition. *L. rediviva* is blooming in the middle and late spring when *L. annua* just starts to geminate.

It is known that the number of chromosomes is equal for both species (2n=28) (Dvorak, Dadakova, 1984, Krahulkova, 1991). This information was a ground for development of interspecific hybrids between wild species in artificial conditions. At Zapozizhzhya National University the fertile interspecific hybrids between *L. annua* and *L. rediviva* in reciprocal combinations were produced and the investigations of these hybrids were started. The aim was to establish the inheritance of plant development type in the first and second hybrid's generations.

Lunaria annua is an annual plant with green or light-green plant color. Leaves have two formations – with and without stalk. The leaves which are situated on flowering stem don't have stalks. The shape of the leaves is looks like a heart with small outgrowths. Flowers have lilac, pink-lilac or white color.

Lunaria rediviva is a perennial plant with a dark-green or green plant color. All leaves have stalks. The shape of leaves looks like a heart, but the leaf blade has a bigger outgrowths then an annual species. The flower color is lilac, pink-lilac or

pink. White flower color was not described in the literature for this species.

To develop the interspecific hybrids the parental species were grown in controlled indoor conditions. Hybrid's seeds were sown and the F_1 generation was analyzed as well as initial species under the same conditions. All of hybrids were fertile and gave the next generation of seeds. The F_2 generation was sown both indoor and field conditions. Some morphological traits and type of plant development were analyzed. The data were processed.

The dominance of perennial type over annual type was established, because all F_1hybrids in both crossing combinations had perennial type. In second generation the ratio about 3 perennial type: 1 annual type in *L. rediviva* × *L. annua* cross combination was observed. However, in reciprocal combination three groups of plants (perennial, annual and plants with intermediate type of development) were found. The plants with intermediate type of development started their flowering at the first year of life, but much later than annual species. After flowering they didn't stop their growth and after pod set saved a rosette of leaves. Next spring they secondly flowered and set the pods and only after that they died.

References

Dvorak F., Dadakova B., 1984. Chromosome Counts and Chromosome Morphology of Some Selected Species. Folia Geobotanica et Phytotaxonomica. **19**: 41-70.

Exercise 3. Write your own example of Conference Abstract.

Exercise 4.Prepeare your own poster for the conference to present your own scientific work.

Exercise 5. Make up a dialogue between two participants of the conference. One of them demonstrates his/her Poster presentation.

? Checklist

- What are the main rules of the participation in conferences?
- How can you briefly describe your work?
- What words can you use speaking to your colleagues from other countries?

UNIT 6
Theme: Curriculum Vitae (CV)

Wit & Wisdom: "Genius without education is like silver in the mine." (Benjamin Franklin – American statesman and scientist)

Exercise 1. Study the following schemes of CV. Read and translate it into Ukrainian.

Scheme 1.

First Name
Last Name
Objective
Use a specific job title here, or write a brief, simple phrase describing the type of work you are seeking.
Summary
Summarize your background and most valuable attributes.
Using concrete examples, explain to potential employers precisely what you will be able to do for them.
Describe your unique gifts and strengths. Write this section last, as it is often the most difficult to write.
Personal Data
Date of birth:
Age:
Place of birth:
Marital status;
Children, their ages Address:
Phone:
Home phone:
Fax,
E-mail:
Education
20XX-20XX Degree obtained, school name
Additional Education
20XX-20XX Degree obtained, school name
Job Experience
20XX-20XX Name of Company, Position
Using action words to maximize the impact, describe your current or most recent responsibilities.
Be concise; remove all unnecessary words & phrases. Include the specific results of your actions or decisions to demonstrate your contribution
Languages Knowledge
List languages, include mother language, and describe your level of knowledge.
Computer & Technical Skills
List software applications, operating systems, and pertinent hardware information.
Include years of experience, or describe your level of knowledge.
Licenses & Certificates
List licenses or certificates you hold that are pertinent to the job you are seeking.
Include the year you obtained each license or certificate.
Interests & Activities
List only those interests and activities that you regularly participate in.
Use a specific job title here, or write a brief, simple phrase describing the type of

work you are seeking.

Scheme 2.

Name
Street Address City, State, Zip Code
Phone number
e-mail
EDUCATION
School Name City, State
Degree or Coursework
Accomplishments YYYY
EMPLOYMENT
Company Name City, State
Supervisor Name
Position held YYYY to YYYY

Company Name City, State
Supervisor Name
Position held YYYY to YYYY

Company Name City, State
Supervisor Name
Position held YYYY to YYYY

Exercise 2. Study the following example of CV. Read and translate it into Ukrainian.

Kelly Long
Address: 912 Weary Street - San Diego, CA94I33
Home phone: 203.555.5555
Cellular phone: 203.777.777
Email: qwerty@domen.net
Position: Office Manager

Summary of Qualifications. An office manager with over 15 years' experience in Medical Office Operations within fast-paced environments. ability to lead and motivate employee. Familiar with all aspects of daily business operations including: Personnel, Human Resource Issues. HIPPA and OSHA Compliance. Contract Negotiations. Payroll. Federal Tax Preparation and numerous administrative functions.

Core Professional Strengths

- Team Bulging Policies & Procedures Problem-solving;
- HIPPA Officer;
- Workers Compensation;
- Employee Motivation;

- Claims Process Disability;
- Claims Staff Training &Development;
- Contract Negotiations Accounts;
- Payable & Receivable Quarterly;
- Tax Returns Medical Knowledge & Terminology Customer Service.

Professional Experience

CNB. Dallas. Co Office Manager1994 - Present

Oversees daily medical office operations managing a staff of 12 employees. Responsibilities include Administrative. Billing. Personnel Issues. Human Resources Policies & Procedures, Payroll and Quarterly Tax preparation and submission.

- Responsible for negotiating, completing and submission of all contracts with all insurance companies.
- Maintains compliance in areas such as OSHA, HIPPA, Coding issues and updating Policies &procedures.
- Prepares and distributes Payroll in addition to Quarterly Payroll Tax preparation.
- Post all charges and payments for insurance companies including transmissions of all electronic claims to clearinghouse.
- Oversees Inventory and Purchases of Medical and Office Supplies. Medical / OfficeAssistant1989-1994

Assisted and performed numerous office procedures such as: Respiratory Therapy, Surgical Procedures, Physical Therapy. I.M. Injections. Cardiology Procedures and Urinalysis and Strop Cultures, Performed daily office functions such as; Insurance Verifications, Precertification and Referrals.

Computer Skills

Physician Office Manager (POM), Quicken, QuickBooks, Lotus 123, Word Perfect. Excel, Access.

Education

Vermount University. Cats. Co

Currently pursuing Bachelor of Science. Business Administration - 78 Credits Completed.

Professional Training & Skills

OSHA Training, Medical Terminology, HIPPA Training, CPT/ICD 9 Beginner & Advanced.

Exercise 3. Discuss the given CV above (education, experience, abilities and skills).

Exercise 4. Write your own CV.

? Checklist

- Why is it so important to have a good CV?
- What is the main idea for the writing CV when you are a student?
- What is the main idea for the writing CV when you have a degree?

STUDENTS' INDEPENDENT WORK
(САМОСТІЙНА РОБОТА СТУДЕНТІВ)

PART 1. BOTANY AND PLANTS

Read and translate into Ukrainian the following texts:

WINDOWSILL MICROPROPAGATION?

After breeding *Verbascum* hybrids for a few years, we needed a different reliable method of propagation which would allow us to produce at least a dozen plants from a single specimen. When a new hybrid is bred, there is only the single plant and digging it up to make root cuttings can cause serious damage. Traditionally, clones would be produced by taking root-cuttings about 2.5 cm/l in long or even longer. Initially we used this method and found that you could grow a few extra plants quite easily, but a dozen or so plants meant chopping up to 30 cm/1 ft or more off the root. We began to wonder just how small you could make the cuttings. Pieces about 1 cm/½ in long were found to grow very easily. We then tried pieces only 5 mm/¼ in long and they gave equally good results, so we kept reducing the size of the cuttings until we discovered that pieces only 2 mm/ 1/12 in long would grow successfully.

Suddenly we discovered that some very odd things were happening. We always took care that these thin slices were planted the right way up, pressing them into the surface of the compost so that the top of the slice was visible after planting. Apparently, the thin root discs would lose their polarity and produce sprouts on the 'wrong' side and often the slices would split and fail to grow. It became apparent that the splitting was due to the upper surface drying out more than the lower which was in contact with the moist compost.

Since the polarity of the root slices seemed to be unimportant when they were very thin, we decided to try planting them on the edge so that both flat surfaces were equally in contact with the compost. This solved the problem of splitting and we were soon experimenting with slices only 1mm/ 1/25 in thick, most of which grew perfectly well. We were then able to obtain material for propagation by simply excavating a small hole beside a specimen plant, locating a suitable root and taking only a few centimeters from it with a sharp knife.

Although we have only used this method with *Verbascum*, it could well work with other plants which are usually propagated by root cuttings, such as oriental poppies and lupin cultivars. We would be interested to hear from readers who try.

Very fine textured compost is essential. We use a peat-based seed compost, passed through a 4 mm/ 1/6 in-mesh sieve and, for *Verbascum*, add chalk. Other types of plants may need different composts. We use trays of thimble-sized cells (20 × 20 mm/ ¾ in × ¾ in), standing on capillary matting in an unheated propagator. The cells are pre-watered and the thinly-sliced cuttings are inserted in slits made with a penknife blade in the surface of the compost. After planting, the edge of the cutting is

just visible at the surface. A razor blade and some manual dexterity are needed but we have grown 800 plants this way so far this year using the kitchen and bathroom windowsills.

PLANTS FOR GARDEN PONDS

Oxygenating plants. Oxygenating plants provide shelter for spawning fish and they fry, as well as releasing oxygen directly into the water in strong light. They also take up mineral salts from the water that would normally encourage the growth of algae. A dozen or so should be planted in a small container and allow one container to every 2 m^2 in a small pool, but as the pool enlarges relatively fewer containers are needed; a pool of over 55 m^2 would require twenty containers. If the plants become too prolific it is a simple matter to lift out a few containers to allow more space.

Deep water and marginal plants. There are many aquatic plants that grow in deep water. Their roots need soil and this is best kept in a container, allowing the plant to be lifted jut of the water for pruning, treating for pests and diseases and for feeding. The container can be a box, pot, basket or a proprietary plastic container. The soil should be plain with the addition of bone meal; some charcoal lumps will help to keep the soil sweet.

Some plants float on the surface with trailing roots that pick up nutrients from the water and these can be easily lifted out and thinned if they spread too far.

Marginal plants in the main have their rootstocks just under the water with their leaves and flowers held well above the surface. Here again, containers should be used to allow the plant to be lifted out, thinned and stopped from talking over the pond. Many aquatic plants are invasive.

Water lilies. The water lily is justifiably the most popular of water plants. It has brilliant blooms and at the same time its leaves cover the water surface to provide both shelter to fishes and welcome shade that prevents excessive algae growth, in addition, water lilies – all species and hybrids of Nymphaea – are available in a variety of sizes to suit the size and depth of any pond, from the pygmy types that need just a shallow covering of water to the more vigorous types that would swamp a small pond completely and need deep water to prevent the leaves from standing proud of the surface.

Water lilies should be grown in containers. They will give sufficient anchorage and nutrition while stopping the plant from outgrowing the pond. They will also allow easy access to the plant for maintenance, treatment for disease or pest attack, and feeding. Containers allow a certain flexibility of position and can be adjusted to give the right depth of water over crown of the plant; this is achieved by inserting bricks or other inert material under the container to raise it.

There are two main groups of water lilies: the hardy and the tropical. In temperate zones the hardy ones are fine for outdoor ponds; the tropical lilies are only suited to indoor and outdoor ponds where the water temperature is maintained at 21^0 C throughout the year.

The best soil to grow water lilies in is a heavy loam well-fortified with bone meal (approximately 0.1 liters per 4.5 liters of soil). Animal manures are not

recommended as the water becomes over rich with nutrients that will encourage algae growth. Should the loam be poor quality and low in nitrogen mix some dried blood into the soil. The roots should be well anchored by ramming the soil well down in the container, leaving some room for a layer of shingle or gravel over the soil to prevent fish from stirring up the fine particles and making the water cloudy.

Water lilies need sun, plain soil and the right depth of water. Given these they will reward the gardener with a prolific show of flowers from early summer onwards.

Bog plants. Stretches of open water are often surrounded by wetlands, areas of constantly moist soil where the water table is just beneath the surface. A number of plants have adapted their root system to cope with this high moisture level. Many of these 'bog plants' have brightly colored flowers and interesting leaf shapes and make fine subjects for planting near a garden pond.

RADISH

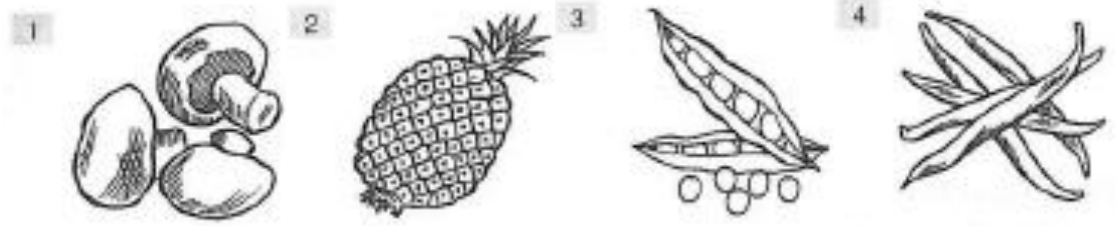
Soil facts. All gardening books will tell you that radishes require fertile, well-drained soil, rich in humus and free from stones. But radishes generally have to put up with what they are given. Despite this lowly status, they must be given some soil preparation to ensure the quick growth so necessary for tenderness and flavor. Dig in some peat or well-rotted compost. Apply a fertilizer before sowing and rake to a fine tilt.

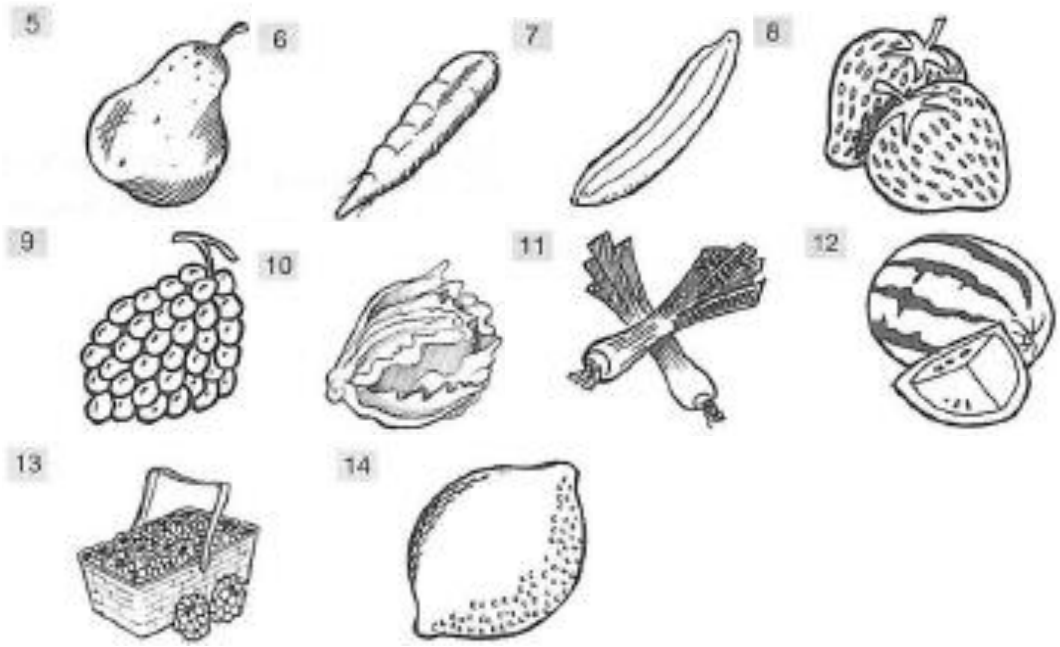
Looking after the crop. With the Summer varieties little or no thinning should be necessary. If there is any overcrowding then thin immediately so that the plants are 1-2 in. apart. Protect the crop against birds. Spray with Derris or Crop Saver if Flea Beetle begins to perforate leaves. Hoe to keep down weeds. Water if the soil is dries; rapid growth must not be checked.

Harvesting. Pull the Summer varieties when the globular ones are penny-sized and the intermediates are no longer than you thumb. They can, of course, grow much longer, but these overgrown specimens would be hot, woody and hollow. The winter varieties can be left in the soil and lifted as required during the winter. But it is better to lift them in November and store as for carrots.

Write the numbers of the corresponding figures.

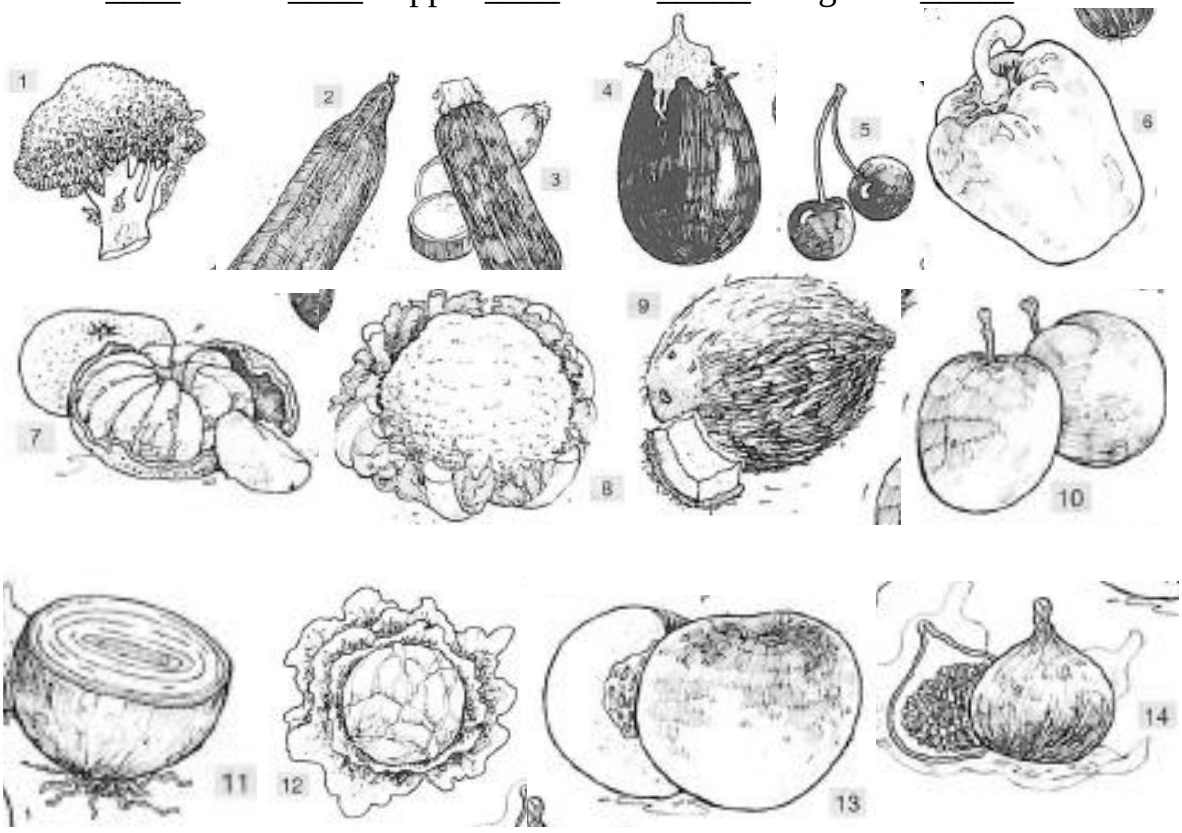
Beans ___ Carrot ___ Cucumber ___ Grapes ____ Leeks ___ Lemon ___
Lettuce ___ Mushrooms ____ Pear ___ Peas ____ Pineapple _____
Raspberries _____ Strawberries _____ Watermelon _____



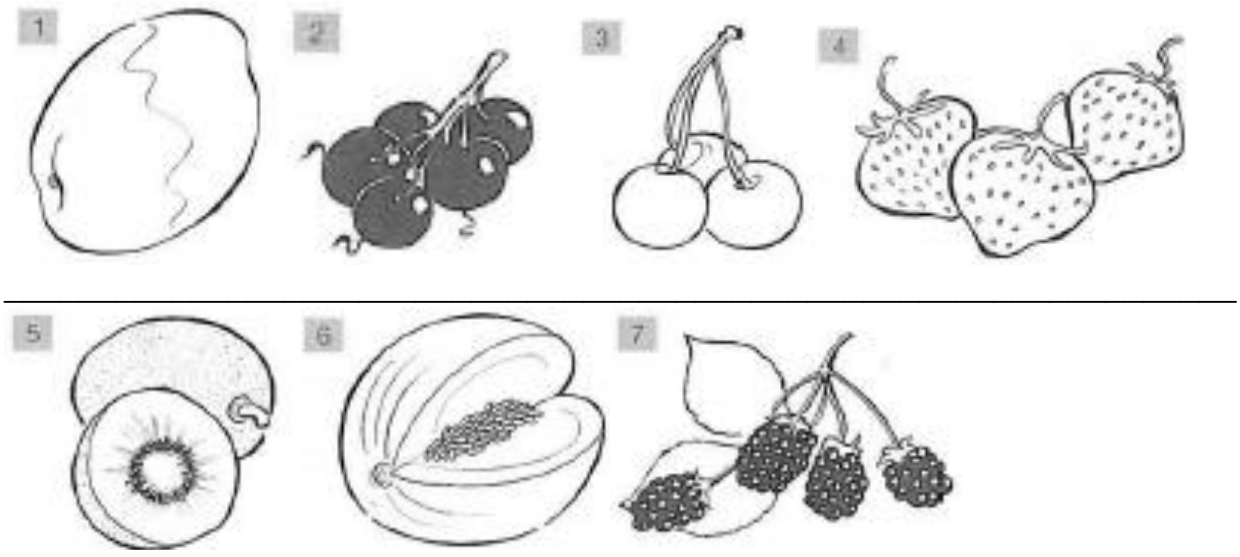


Write the numbers of the corresponding figures.

Aubergine ___ Broccoli ____ Cabbage _____ Cauliflower ____
Cherry ____ Coconut ___ Courgette ____ Cucumber ____ Fig ___
Onion ____ Peach ____ Pepper ____ Plum _____ Tangerine _____



Write the suitable words using words given below: blackberries, blackcurrants, cherries, kiwifruit, mango, melon, strawberries.



PART 2. ZOOLOGY AND ANIMALS

Read and translate into Ukrainian the following texts:

POND LIVESTOCK

Fishes for garden ponds. One of the most exciting aspects of the garden pond is the livestock that it can support. Of these, the most spectacular and interesting are the fishes, which provide a continuous movement and sparkle that people of all ages find fascinating. The golden varieties of fish are the most easily seen and appreciated; the dark green varieties are well camouflaged and need patience to see them and watch their movements. The brighter fish are more vulnerable to predators, and a sufficient cover of plant life in the pond is necessary for their protection.

Fishes are important to the pond environment, as they take in oxygen from the water and then expel carbon dioxide through their gills; the carbon dioxide is then absorbed into the plant tissues along the water. Carbon, hydrogen and oxygen are processed within the plant with sun's rays, a process called photosynthesis, giving off surplus oxygen into the water for the fishes to take up again and repeat the cycle for the benefit of both fishes and plants. At night the process is reversed, with the plants taking up oxygen and releasing carbon dioxide. This can cause a low level of oxygen in the morning making the fishes sluggish. As soon as the sun rays start working on the plant life the oxygen starts moving again.

Some fishes are scavengers, acting as unwitting cleaners in the pond by taking up debris from the pond floor and water as food. It is advisable to cover all soil with a layer of stones or gravel to prevent the soil being stirred up and clouding the water, stopping the fishes from being seen clearly in the pond.

For describing each individual species of fish, there is a detailed terminology for the various fins and points; this is very useful to know about in order to read the literature supplied by fish fanciers and dealers, and books on the subject.

Other pond livestock. Apart from the livestock deliberately introduced into the water, other forms creep in uninvited, but most of these are beneficial, either keeping the pond clean or providing a ready meal for the fishes. Other are more trouble, however, causing damage to fish and plant life, especially the small fry and the young fresh growth; it is important to keep an eye on the health of the pond life and spot any damage to fishes or plants that may have been caused by an unwanted guest. Among the vast amount of livestock it is quite difficult to determine which is friend and which is foe, and it is impossible to keep an outdoor pond free from the visitations of insects and other life forms.

Snails. One of the few animals that need to be introduced into the pond is the snail. There are a number of aquatic snails that will happily feed on debris and help to keep the pond clean without feeding on the plant life.

Planorbis corneus (the Ramshorn Snail) can be put into the pool to clean up unwanted rubbish. It is easily recognized by its handsome flat coiled shell, and breeds well. It will not damage useful vegetation, and is readily available from aquatic dealers.

Viviparus viviparous (the Freshwater Winkle) delights in feeding on dead and decaying vegetation, and is popular with fish keepers. If disturbed it will cling very tightly to whatever it is attached to, resisting any attempt to pull it off, no matter how hard.

Viviparus fasciatus is very similar to *V. viviparous*, and also eats decaying plant life; but it is also completely different, in that it releases itself the moment it is touched.

Most of the other snails that are found in the pond introduce themselves and can be left to populate the water unless they are seen to feed on your prize aquatics. Some are small and insignificant, others are larger. Some of the bigger snails are from the Lymnaea family, which includes the Great Pond Snail (*Lymnaea staginalis*), a snail that through indiscriminate feeding can cause a lot of damage and should be removed.

Amphibians. Amphibians visit the pond to lay their eggs or spawn; some fish keepers find the spawn unsightly and remove it, but the young are beneficial to the balance of life in the water. Young tadpoles are excellent scavengers, starting off by eating vegetable matter and progressing to animal foods. Frogs, toads and newts should all be welcome because they do so much good in the garden, removing unwanted pests such as insects.

Beetles and other insects. There are well over 200 different species of aquatic beetle; some of these are savage and carnivorous, attacking fish and other water animals, but most are happy scavenging among the debris and keeping the pond clean. Unless attacks are seen, it is best to leave most beetles alone.

Surface walkers are often seen traversing the water relying on the surface tension to stop themselves sinking. The best-known of these is *Gerris najas* (the Pond Skater), which literally walks across the water on the lookout for dead or dying insects.

There are a large number of flies that leave their eggs in or close to water, from the humble midges and gnats to the larger caddis flies and dragonflies. Their eggs

turn into larvae that prey on lower water creatures, other larvae and tiny fishes, and they in turn become food for larger fishes. There are over 160 different kinds of caddis fly. One of the commonest is *Phryganea grandis* with pale grey-brown wings and yellow-ringed antennae; it folds its wings along its body when at rest, like all the caddis flies. Their larvae form cases or tubes from fine particles of vegetation, stones, sand or shell to live in until the next stage in their development into flying insects.

The dragonflies form a large group of insects well-known for their spectacular coloring and erratic flight pattern. Their eggs are laid on the water surface and then sink to the bottom. When the larvae are hatched they form burrows in which they lie low, preying on small aquatic animal life; then they gradually change until they eventually become flying insects. Dragonfly larvae (nymphs) can be considered a pest. Among the other flies are *Culex pipiens* (the Common Gnat) and *Chaoborus* sp. (the Midge). The larvae of these are a good food for fishes, and anyone who fails to keep fishes in the garden pond is likely to become aware of a subsequent noticeable increase in the gnat and midge population.

BASIL BRUSHLESS

He can flick is flamboyantly, curl it up coyly or simply twirl it around toes.

But the sparseness of this squirrel's tail will ensure he won't be snuggling up with a mate in winter.

Bright, bushy tails are a major part of squirrel courtship rituals, leaving Basil, as he is known, at a distinct disadvantage.

When he first appeared in Vicki Walker's garden in Portchester, Hampshire, she thought he was a rat. Other squirrels, it seems, will think the same. 'It's not a case of "I've got the best brush look at me", but the tail does play a very important part in the courtship process,' said Richard Grogan, wildlife officer for Hampshire and Isle of Wight Wildlife Trust.

"Without that, the squirrel's chances of finding a mare are severely hampered.' Mr. Grogan believes Basil's sparse tail is probably a genetic defect.

'Alternatively, the hairs could have been pulled off by another animal but you would expect hair to have been removed from other parts of the body as well,' he said.

Basil, pictured above enjoying a snack and getting to know a collared dove, is now a favorite in Mrs. Walker's garden.

'When I first saw him I was ready to call in pest control,' she said.

'But despite his odd appearance he is more than welcome and has become one of my regular visitors.'

HOW CAN ANIMALS LIVE IN A DESERT?

There is almost no water in a desert, but many animals can live in deserts. How do these animals get water and stay alive?

Everything is hot and dry in the daytime, but the nights are cold. Plants often have dew on them in the early morning. This is because cold air can't hold as much

water as hot air. Small insects can drink the dew, and bigger animals eat the plants with the dew on them.

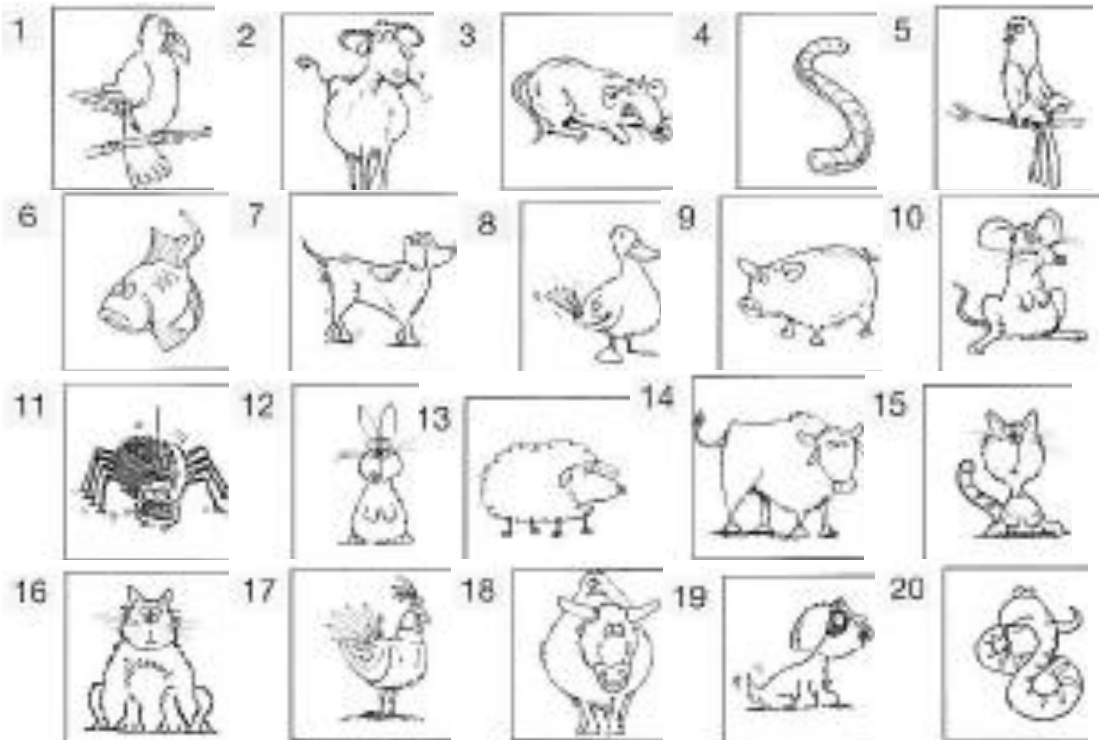
Small birds and animals get water from the bodies of insects. Bigger birds and animals get water from the bodies of small animals. The North American bird called a roadrunner runs fast and catches small snakes, lizards and scorpions.

Some animals can wait many years for water. When rain falls, baby shrimps come out of their eggs. They grow quickly and lay new eggs. Then the water dries up, and the shrimps die. But the new eggs do not die. They wait in the ground for the next rain. They can wait for 50 years!

Most big animals can't live in the desert because they need a few liters of water every day. They can't keep water in their bodies for a long time. But camels are different. They can drink 90 liters of water in ten minutes, and then drink nothing for 40 days.

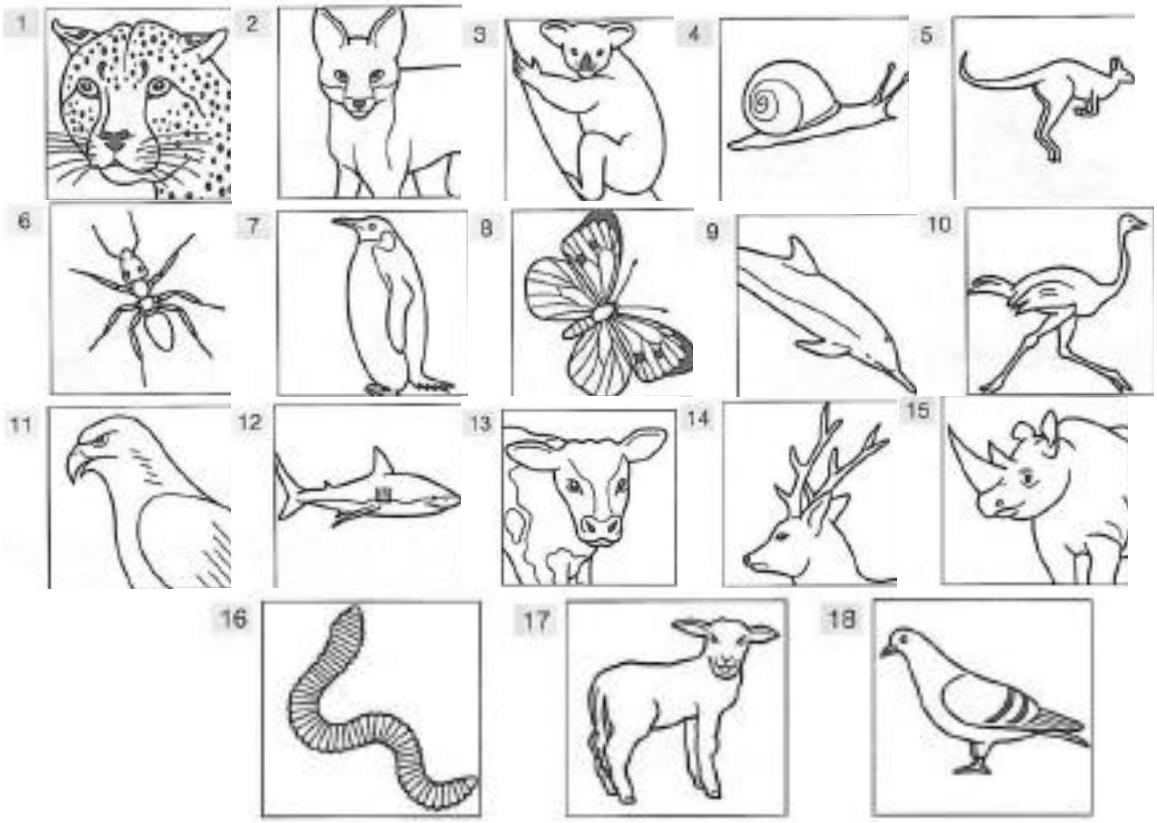
Write the numbers of the corresponding figures.

A budgie ____ A dog ____ A mouse ____ A rat ____ A bull ____ A duck ____
A parrot _____ A sheep ____ A cat ____ A goat ____ A pig ____ A snake ____
A chicken _____ A goldfish ____ A puppy ____ A spider ____ A cow _____
A kitten _____ A rabbit _____ A worm _____

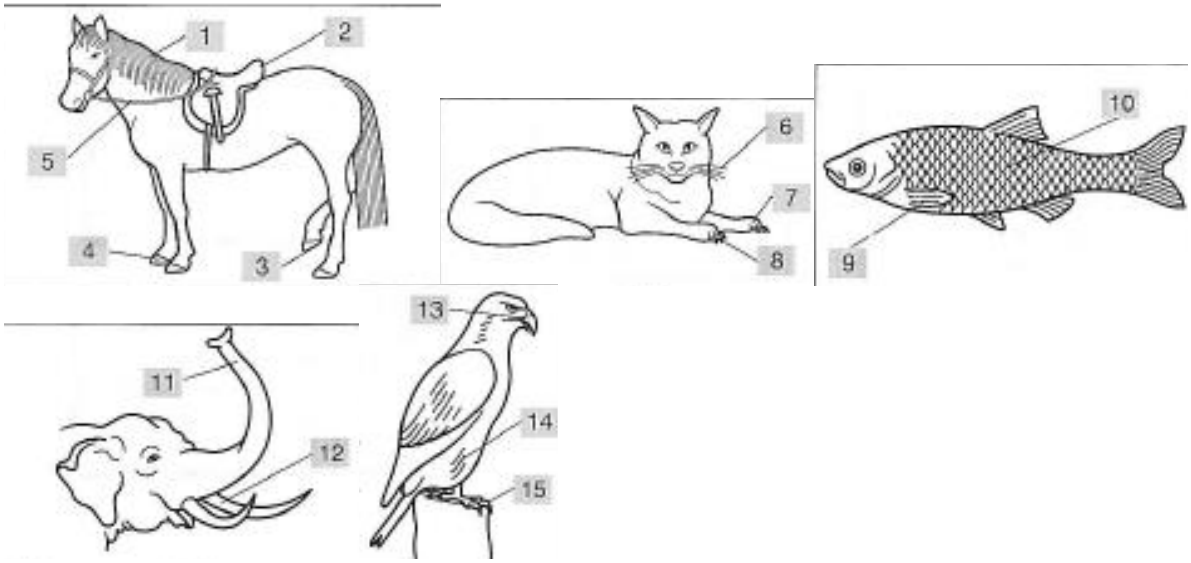


Write the numbers of the corresponding figures.

Ant ___ Butterfly ___ Calf ____ Cheetah ____ Deer ___ Dolphin ____ Worm ___
Eagle ___ Fox ___ Kangaroo ____ Koala bear ____ Lamb ____ Ostrich ____
Penguin ____ Pigeon ____ Rhinoceros _____ Shark _____ Snail _____



✎ **Write the suitable words using words given below:** beak, claws, feathers, fin, hoof, mane, raw, reins, saddle, scales, shoe, talons, trunk, tusk, whiskers.



1 _____ 2 _____ 3 _____ 4 _____ 5 _____
6 _____ 7 _____ 8 _____ 9 _____ 10 _____
11 _____ 12 _____ 13 _____ 14 _____ 15 _____

PART 3. HUMAN

Read and translate into Ukrainian the following texts:

UNDERSTANDING MEMORY

Remembering and forgetting are most common experiences that function daily in the life of a person. One may remember a traumatic experience that occurred in childhood and may forget what formula to use in the examination or still simpler thing what dress he wore yesterday.

One may remember throughout his life that India attained independence in 1947, but can forget his father's birthday. The very act of speaking means that we are remembering and recalling the words of our language in grammatical sequence and we have also to keep track with our conversation, i.e. what we said just now; otherwise our conversation will be senseless.

In most cases memory means retaining information which we have learnt or heard. Some people can remember more of what they have done or seen or heard than others and so they are said to have better memories. The capacities of remembering vary from one another in certain aspects. But they have some elements in common.

Like in each case, the present experience or the present behavior of an individual is determined by something that has happened in the past. Memory consists of learning, retaining, recalling or recognizing. For example, when we remember the name of a person, we demonstrate that we have learnt the name earlier and that we have retained it during the intervening period and are still able to recall the name at any time.

A distinction is often made between two kinds of memory: rote memory and logical memory. Rote learning results from the mechanical process of repeating it by heart, without understanding the meaning. A small child who sings a nursery rhyme is demonstrating rote memory without any comprehension, while logical memory is the remembering / retention of the material with its meaning.

According to Atkinson-Shiffrin's psychological theory, memory is divided into two: one is short term memory (STM) and the second is long term memory (LTM). If an individual has to reproduce what he has learnt immediately after learning it, he employs, what is referred to as short-term memory or immediate memory, where it is held only for 20-30 seconds.

For example, you asked a phone number from the telephone operator and did not write but thought that you have learnt it, if the telephone line is busy, and if you have to wait for a minute or two, before dialing again, you may forgot the number by then. This is the case, when material is stored in STM. Our STM has a very limited capacity; it is believed. Miller, another psychologist, in 1956, found that the capacity of STM is (7-2=5) or (7+2=9). This means that a person can retain in STM not more 9 bits of information. This is a reason why telephone numbers or vehicle numbers are never more than 9 digits or numbers.

While the material in LTM may retain for days, weeks, months or years. The

long term memory has no limits to its capacity; some theorists believe there is no forgetting from this.

In contrast to memory comes forgetting, i.e. the apparent loss of information already encoded and stored in long-term memory. The question arises, why do we forget? There is no single or simple answer to it.

The oldest explanation to forgetting is misuse, because it is often seen that driving, swimming, riding a bicycle, are such skills, which are never forgotten, although they might be use seldom. Another reason is distortion. For example, if a person is asked to recall something like a story after different intervals of time, it will be noticed that his memory of the learned material undergoes distortions. There might be distortions due to loss of information or even the other way round, i.e. addition of details. As a result, the actual content of the story is thus forgotten.

SCIENCE OF THE HEART

It is the most widely prescribed medical test in the United States. And no wonder. The electrocardiogram tells the inside story of how that most vital of organs, the heart, goes about its work of pumping the nourishing blood of life throughout the body.

Ninety-one years have passed since Willem Einthoven, a Dutch physician-physiologist invented the first practical way to measure what happens when the heart beats. By graphically tracing the electrical impulses that spark the heart's action, he opened the field of electrocardiography. In the decades since, many pioneers have improved on Einthoven's invention, and today an electrocardiogram offers detailed and precise information on the condition and performance of the heart.

This year, Wyeth-Ayerst pays special tribute to the medical heroes who made this possible. Twelve of them are pictured in a special 1992 calendar distributed to cardiologists. The calendar is part of the company's marketing program for a trio of drugs to treat the arrhythmias that electrocardiography detects. Arrhythmias are variations from the normal heart beat and are the principal reason a physician orders an electrocardiogram, or ECG.

"The ECG is a simple test for a patient" said Marc W. Deltch, M.D., Vice President of Medical Affairs and Medical Director of Wyeth-Ayerst Laboratories. "It's quick, painless, and there is little risk. Because it identifies otherwise invisible heart conditions, the ECG has become an irreplaceable part of medical diagnosis."

Sometimes variations in heart rhythm are normal, and may be caused by exercise, caffeine, alcohol, drugs, or congenital defects. Everyone experiences these to some degree. But when arrhythmias occur frequently, they put a strain on the heart by making it work harder to maintain normal blood flow.

Electrocardiograms help to detect these problems, antiarrhythmic drugs work to correct them. Wyeth-Ayerst offers three such medications. In fact, "Wyeth-Ayerst is market leader in the antiarrhythmic arena", said Bob Czenszak, Group Product Director for the antiarrhythmic brands.

SLEEPING SICKNESS

Folks who snore and feel drowsy the next day –even after eight hours of sleep – may have problems more serious than just getting a good night's rest. A study finds that snoring sleepyheads are twice as likely to suffer a stroke as ordinary snoozers. How come? The odd sleep patterns may be a sign of sleep apnea, a condition in which breathing briefly stops throughout the night – possibly disrupting blood flow to the brain.

✎ **Write the numbers of the corresponding figures from figure 1.**

Arm ___ Back ___ Bottom ___ Ear ____ Eye ___ Foot ____ Hair ____ Hand ____
Head ___ Knee ____ Leg ___ Mouth ____ Neck ____ Nose ____ Teeth ____

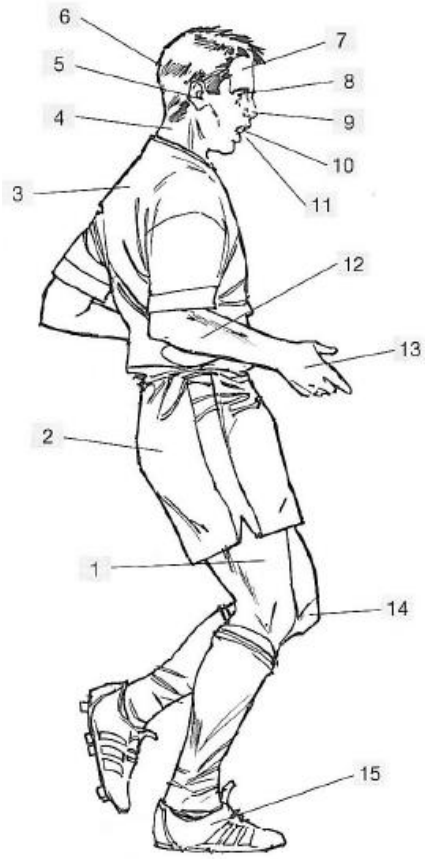


Figure 1.

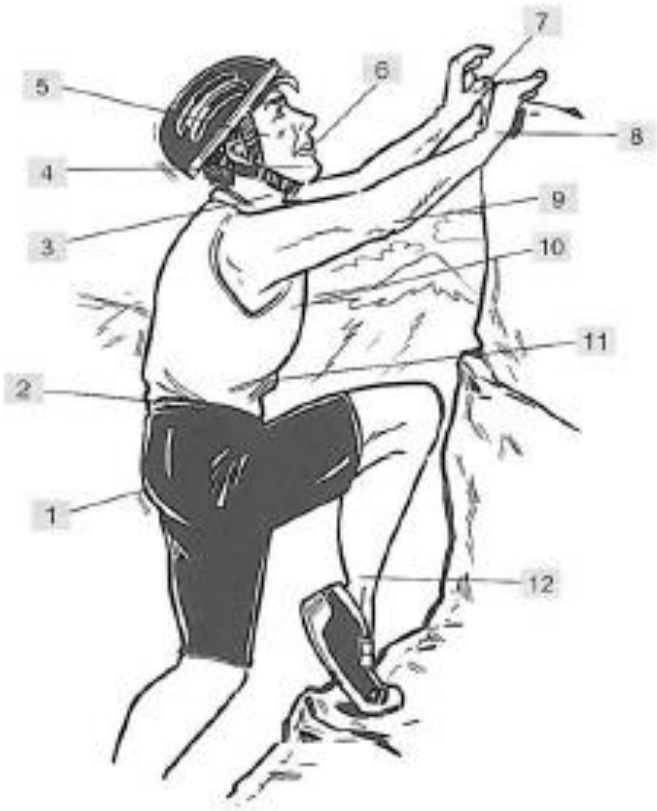
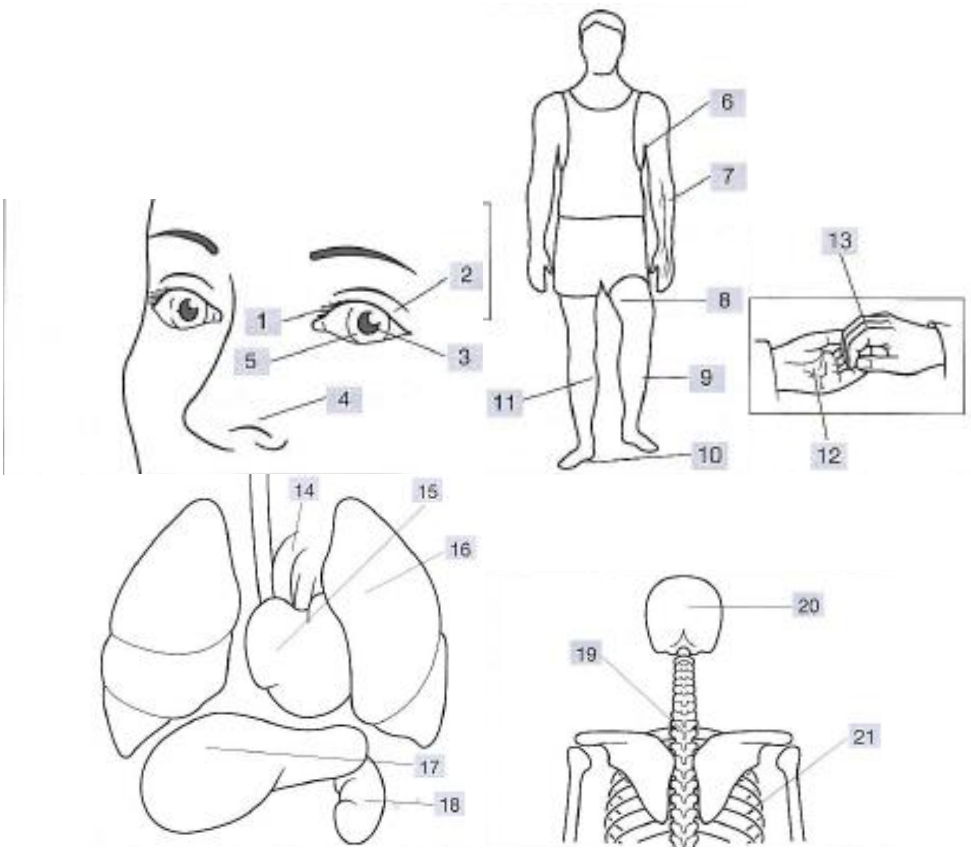


Figure 2.

✎ **Write the numbers of the corresponding figures from figure 2.**

Ankle ___ Bottom ____ Cheek ____ Chest ____ Chin ____ Elbow ____ Lips ____
Stomach ____ Throat ____ Thumb ____ Waist ____ Wrist _____

✎ **Write the suitable words using words given below:** armpit, artery, calf, eyelash, eyelid, heart, iris, kidney, knuckle, liver, lung, nostril, palm, pupil, ribs, shin, skull, sole, spine, thigh, vein.



1 _____ 2 _____ 3 _____ 4 _____ 5 _____
6 _____ 7 _____ 8 _____ 9 _____ 10 _____
11 _____ 12 _____ 13 _____ 14 _____ 15 _____
16 _____ 17 _____ 18 _____ 19 _____ 20 _____
21 _____

PART 4. ECOLOGY

Read and translate into Ukrainian the following texts:

UNUSUAL PARTNERSHIPS

There are many types of relationships in the animal world. A very familiar example is when one animal hunts and eats another. This is the predator-prey relationship. Yet nature is not always so cut and dried. On the seashore, as in other habitats, different kinds of animals are regularly seen together. This does not happen by chance - there is a reason. Scientists have different names for these relationships. In the relationship that is called parasitism, one partner, the parasite, benefits, but the other, the host, loses. Some shore crabs are host to *Sacculina*, a strange creature related to the barnacles. *Sacculina* attaches itself to a young crab and then grows "tentacles" that eat into the crab's body. This parasite gets food while disabling the crab. Another type of relationship, in which both partners benefit, is called symbiosis. The hermit crab and the calliactis anemone live in this way. The calliactis is sometimes called the parasitic anemone, but it does not harm its hermit host. It feeds on particles of food that the crab drops, and the crab is protected by the stinging

tentacles.

Hermits at home. Hermit crabs do not have shells of their own, so they hide their soft bodies in the shells of dead animals. Sometimes an anemone is attached to the shell. As the crab grows and moves to a larger shell, it often takes the anemone along with it. There are also land hermit crabs in the tropics. Some species live in hollow mangrove roots or bamboo stems.

Three-in-one. Each of the three animals in this "partnership" comes from a different major animal group. The hermit crab is a crustacean. The anemone is a coelenterate (cnidarian). The shell once belonged to a whelk, which is a sea snail and member of the mollusk group.

Sting in the pincer. The boxer crab carries small anemones in its pincers. They act as "stinging clubs" and are waved at any creature posing a threat.

Claw in the door. In its defensive position, the hermit crab pulls itself deep inside the shell. The right front claw (cheliped), which bears the large pincer, is usually bigger than the left one, and the crab holds it across the shell's entrance to make an effective door. (In this example the pincer is missing; it may have been bitten off by a predator or squashed by a boulder.)

Sweeping the floor. The tentacles of anemones reach upward for floating or swimming victims. However, a calliactis anemone on a hermit crabs shell tends to hang down and sweep the rocks for bits of food "spilled" by the hermit crab.

Out of its shell. The hermit crab's soft, curled abdomen is clearly visible when the animal comes out of its shell. When it grows too big for the shell, it looks for another, larger shell. The two back pairs of legs are small and adapted for hanging on to the inside of the shell.

On the move. When the hermit crab is moving around, its head, antennae (feelers), front claws, and first two pairs of legs are exposed. Like its crab cousins, the hermit crab is a scavenger and feeds on plants and bits of dead and dying animals – in fact on almost anything edible. A dying animal on the shore is soon surrounded by many crabs picking and pulling at its flesh.

Safe among the stings. Clown fish (these are tomato clowns) live among the stinging tentacles of anemones. The fish develop special defenses on their bodies to prevent them from being stung. It is believed that both partners benefit from this arrangement in various ways. The clown fish are safe from predators in the protective tentacles and may eat "leftovers" from the anemone. The anemone may, in turn, be cleaned in the process and eat food dropped by the clown fish. It is also possible that the brightly colored clown fish attract predators, which the anemone then seizes.

Home in a cone. Not all hermit crabs live in whelk shells. This Pacific flat hermit crab is occupying an empty omaria cone shell. Cone shells are tropical mollusks; some species are extremely venomous.

OCEANS IN MOTION

Oceans cover three-fourths of Earth's surface. The amount of water on Earth today is the same as it was 4.5 billion years ago. The water has been recycled from water beneath Earth's crust, to the surface, to the atmosphere, and back billions of

times. Water changes state by losing or gaining energy. When more water molecules are escaping than are being captured, evaporation is occurring. When more molecules are being captured than are escaping, condensation is taking place. Ocean water is salty because of the salts dissolved in the water. The salinity of seawater is much greater than that of freshwater sources that empty into it. On average, 34.7 grams of dissolved solids are in each 1000 drams of ocean water. The density of water increases with an increase of salinity. The density of ocean water increases with a decrease of temperature and/or an increase of pressure.

Solar energy and forces within Earth and Earth's rotation are the basis for the circulation of ocean waters and water cycle. The deflection of particles in motion along Earth's surface to the right in the Northern Hemisphere and to the left in the Southern Hemisphere is known as the Coriolis effect.

Earth's rotation also causes patterns in the global climate because of the difference in temperature of air passing over water as opposed to the temperature of air passing over land.

The marine food chain consists of a sequence of organisms that transfer energy from primary producers to primary consumers, to secondary consumers, to tertiary consumers. These kinds of organisms are generally described by their depth in the water and their distance from the shore.

Besides food resources found in oceans, many other resources are found there. The ocean floor contains significant amounts of oil and natural gas.

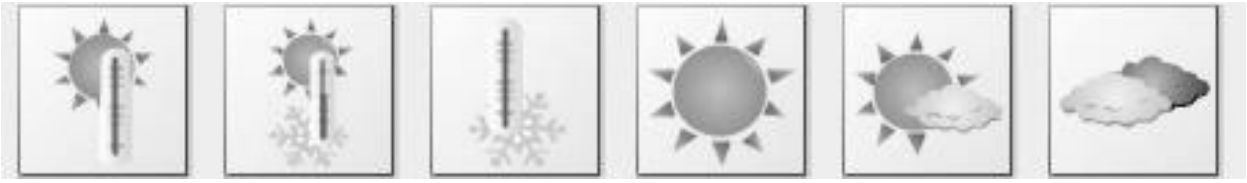
ACID RAIN

Acid rain occurs after the burning of fossil fuels releases sulphur and nitrogenous compounds into the atmosphere. There, sunlight converts these compounds to nitrogen and sulphur oxides, and they combine with water to become acid rain (mostly nitric acid and sulphuric acid). Acid rain changes the pH of lakes and streams and kills many organisms in them. It also injures plants upon which it falls. About half of the Black Forest in Germany has succumbed to its effects. Acid rain also affects nonliving materials. For example, the natural weathering of ancient Mayan ruins in southern Mexico, the Parthenon in Greece, and monuments in Washington, D.C. has been accelerated by acid rain during the past decades.

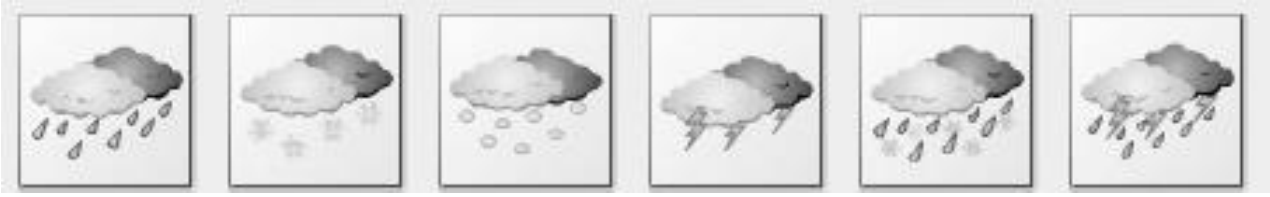
Acid rain is not responsible for all dead or dying trees in the world's forests. Some trees have perished as a result of insufficient rainfall during dry years. Other has succumbed to insect infestations or salt scattered to melt ice and snow on roads, and still others have been weakened by disease.

Write the numbers of the corresponding figures.

Hot ___ Rain ___ Frost ____ Freeze ____ Dew ____ Snow ____ Warm _____
Cold ___ Hailstone _____ Sunny ____ Thunder ____ Fog _____ Cloudy _____
Overcast ___ Rain and snow ___ Wind ____ Thunder storm ____ Strong wind ___



1 2 3 4 5 6

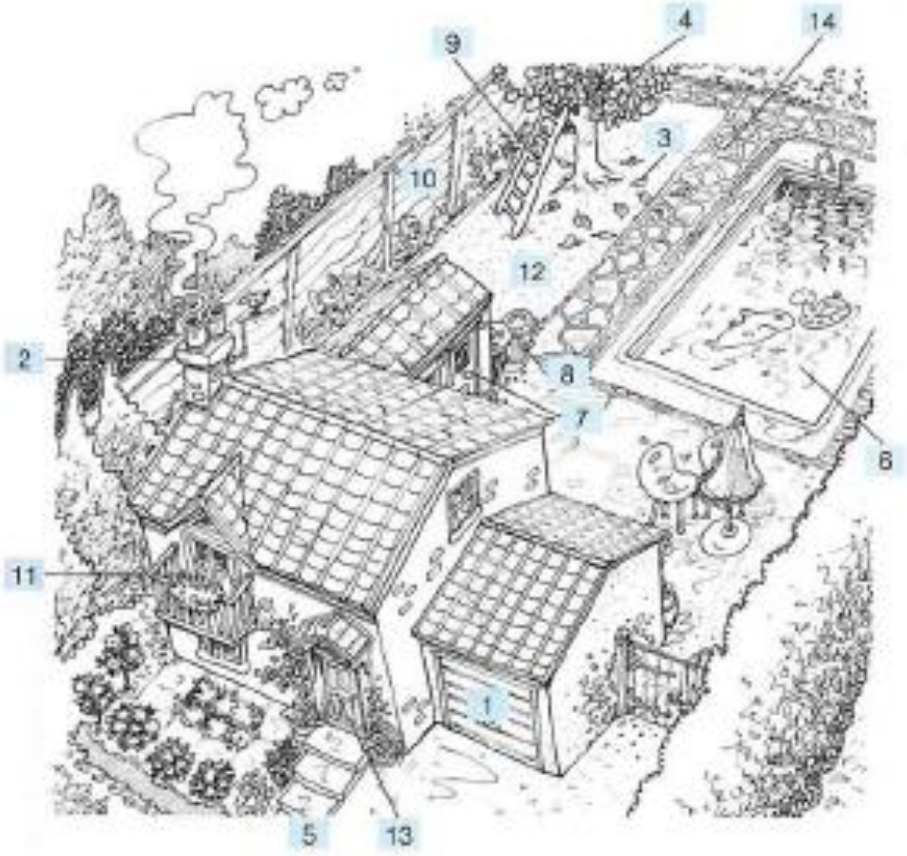


7 8 9 10 11 12

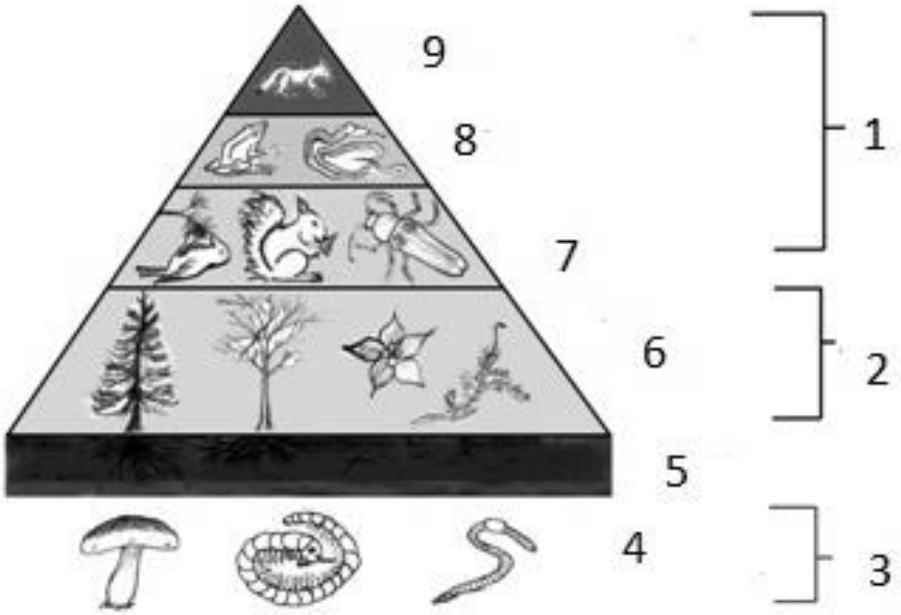
13 14 15 16 17 18

Write the numbers of the corresponding figures.

Apple tree ____ Back door ___ Balcony ____ Bins ____ Chimney ___ Fence ____
Front door ___ Garage ____ Ladder _____ Lawn _____ Leaves ____ Path ___
Pool _____ Steps _____



✎ **Write the suitable words using words given below:** secondary predator, plants, primary predators, soil, herbivores, decay detrivores, heterotrophs (використовується двічі), autotrophs.



1_____ 2 _____ 3 _____ 4 _____
5 _____ 6 _____ 7 _____ 8 _____
9 _____

PART 5. CHEMISTRY AND BIOCHEMISTRY

Read and translate into Ukrainian the following texts:

MOLECULAR STRUCTURE

The physical and chemical behavior of molecules is largely determined by their constitution (the type and number of the atoms they contain and their bonding). Structural formula scan therefore be used to predict not only the chemical reactivity of a molecule, but also its size and shape, and to some extent its conformation (the spatial arrangement of the atoms).

Molecule illustrations. In traditional two-dimensional structural formulas, atoms are represented as letter symbols and electron *pairs* are shown as lines. Lines between two atomic symbols symbolize two bonding electrons, and all of the other lines represent free electron pairs, such as those that occur in O and N atoms. Free electrons are usually not represented explicitly (and this is the convention used in this book as well). Dashed or continuous circles or arcs are used to emphasize delocalized electrons. Ball-and-stick models are used to illustrate the spatial structure of molecules. Atoms are represented as colored balls and bonds (including multiple bonds) as gray cylinders. Although the relative bond lengths and angles correspond to actual conditions, the size at which the atoms are represented is too small to make the model more comprehensible. Space-filling van der Waals models are useful for illustrating the actual shape and size of molecules. These models represent atoms as truncated balls. Their effective extent is determined by what is known as the van der Waals radius. This is calculated from the energetically most favorable distance between atoms that are not chemically bonded to one another.

Bond lengths and angles. Atomic radii and distances are now usually expressed in picometers (pm; 1 pm =10–12 m). The old angstrom unit (E, E = 100 pm) is now obsolete. The length of single bonds approximately corresponds tithe sum of what are known as the covalent radii of the atoms involved (see inside front cover). Double bonds are around 10–20%shorter than single bonds. In sp3-hybridizedatoms, the angle between the individual bonds is approx. 110°; in sp2-hybridizedatoms it is approx. 120°.

Bond polarity. Depending on the position of the element in the periodic table, atoms have different electronegativity – i.e., a different tendency to take up extra electrons. The values given in are on a scale between 2 and 4.The higher the value, the more electronegative the atom. When two atoms with very different electronegativity's are bound tone another, the bonding electrons are drawn toward the more electronegative atom and the bonds polarized. The atoms involved then carry positive or negative partial charges. The van der Waals surface discolored according to the different charge conditions (red = negative, blue = positive). Oxygenic the most strongly electronegative of the biochemically important elements, with C=O double bonds being especially highly polar.

Hydrogen bonds. The hydrogen bond, a special type of noncovalent bond, is extremely important in biochemistry. In this type of bond, hydrogen atoms of OH,

NH, or SH groups (known as hydrogen bond donors) interact with free electrons of acceptor atoms (for example, O, N, or S). The bonding energies of hydrogen bonds (10–40 kJ mol–1) are much lower than those of covalent bonds (approx.400 kJ mol–1). However, as hydrogen bonds can be very numerous in proteins and DNA, they play a key role in the stabilization of these molecules.

APOPTOSIS

Cell proliferation and apoptosis. The number of cells in any tissue is mainly regulated by two processes – cell proliferation and *physiological cell death,* apoptosis. Both of these processes are regulated by stimulatory and inhibitory factors that act in solute form (growth factors and cytokines) or are presented in bound form on the surface of neighboring cells (see below). Apoptosis is genetically programmed cell death, which leads to "tidy" breakdown and disposal of cells. Morphologically, apoptosis is characterized by changes in the cell membrane (with the formation of small blebs known as "apoptotic bodies"), shrinking of the nucleus, chromatin condensation, and fragmentation of DNA. *Macrophages* and other phagocytic cells recognize apoptotic cells and remove them by phagocytosis without inflammatory phenomena developing. Cell necrosis (not shown) should be distinguished from apoptosis. In cell necrosis, cell death is usually due to physical or chemical damage. Necrosis leads to swelling and bursting of the damaged cells and often triggers an inflammatory response. The growth of tissue (or, more precisely, the number of cells) is actually regulated by apoptosis. In addition, apoptosis allows the elimination of unwanted or superfluous cells – e. g., during embryonic development or in the immune system. The contraction of the uterus after birth is also based on apoptosis. Diseased cells are also eliminated by apoptosis – e. g., tumor cells, virus-infected cells, and cells with irreparably damaged DNA. An everyday example of this is the peeling of the skin after sunburn.

Regulation of apoptosis. Apoptosis can be triggered by a number of different signals that use various transmission pathways. Other signaling pathways prevent apoptosis. At the center of the apoptotic process lays a group of specialized *cysteine-containing aspartate proteinases*, known as caspases. These mutually activate one another, creating an *enzyme cascade* resembling the cascade involved in blood coagulation. Other enzymes in this group, known as effector caspases, cleave cell components after being activated – e. g., laminin in the nuclear membrane and snRP proteins – or activate special DNases which then fragment the nuclear DNA. An important trigger for apoptosis is known as the Fas system. This is used by cytotoxic T cells, for example, which eliminate infected cells in this way. Most of the body's cells have *Fas receptors* (CD 95) on their plasma membrane. If a T cell is activated by contact with an MHC presenting a viral peptide, binding of its *Fas ligands* occurs on the target cell's Fas receptors. Via the mediator protein FADD ("Fas associated death domain"), this activates *caspase-8* inside the cell, setting in motion the apoptotic process. Another trigger is provided by tumor necrosis factor-α (TNF-α), which acts via a similar protein (TRADD) and supports the endogenous defense system against tumors by inducing apoptosis. Caspase-8 activates the effector

caspases either directly or indirectly by promoting the cytochrome C from mitochondria. Once in the cytoplasm, cytochrome C binds to and activates the protein Apaf-1 and thus triggers the caspase cascade. Apoptotic signals can also come from the cell nucleus. If irreparable DNA damage is present, the p53 protein –the product of a *tumor suppressor gene* – promotes apoptosis and thus helps eliminate the defective cell. There are also inhibitory factors that oppose the signals that activate apoptosis. These include bcl-2 and related proteins. The genomes of several viruses include genes for this type of protein. The genes are expressed by the host cell and (to the benefit of the virus) prevent the host cell from being prematurely eliminated by apoptosis.

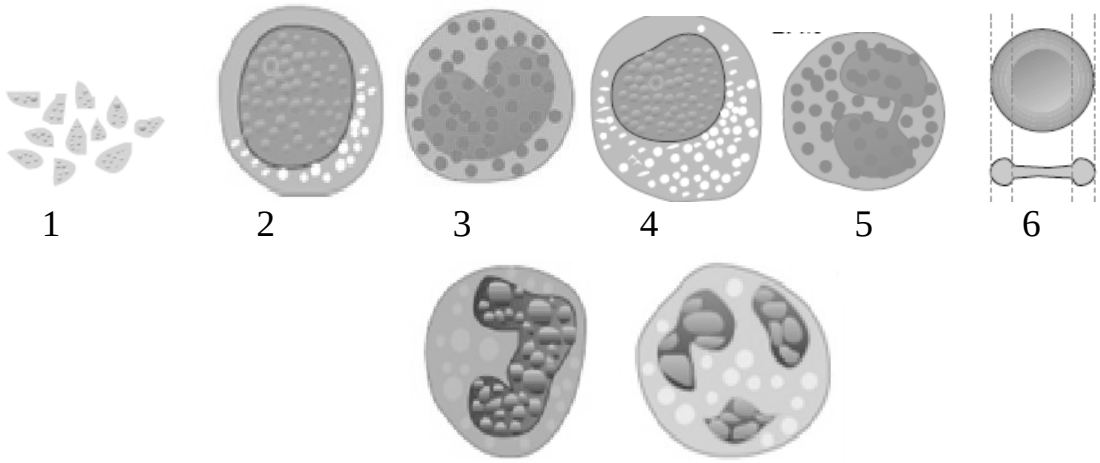
ALKALOIDS

Alkaloids generally include alkaline substances that contain nitrogen as part of a ring structure. The alkaloids, of which more than 6,500 are known, comprise the largest class of secondary metabolites. They occur in several plants families, especially the pea family, the sunflower family, the poppy family, the citrus family, and the potato family. Alkaloids are unknown in mosses, ferns, conifers, and most families of flowering plants.

Alkaloids are diverse group of secondary products, ranging from simple compounds like coniine to complex compounds like strychnine and tomatine. They often produce dramatic physiological effects in humans and other animals. For example, coniine, strychnine, and tubocurarine are infamous toxins, while morphine, codeine, atropine, and vincristine are important therapeutic drags. Alkaloids are often bitter; one of the bitterest substances known is the alkaloid quinine.

Write the numbers of the corresponding figures.

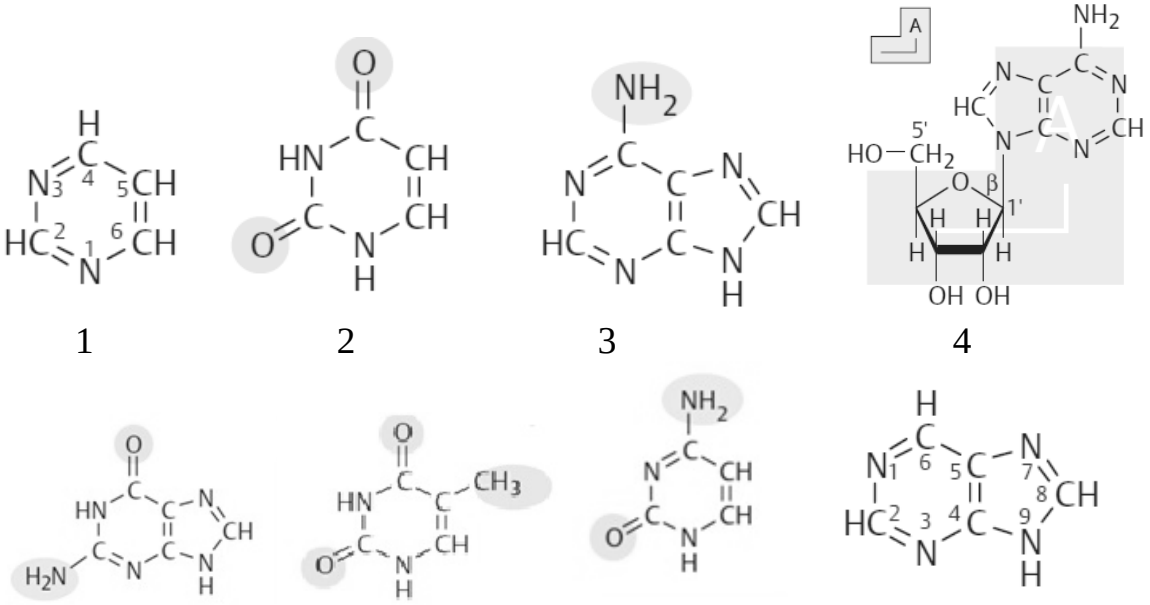
Erythrocyte___ Neutrophilic granulocyte____ Monocyte ____ Thrombocytes ___
Small lymphocyte ____ Large lymphocyte _____ Eosinophilic granulocyte _____
Basophilic granulocyte _____



1 2 3 4 5 6 7 8

Write the numbers of the corresponding figures.

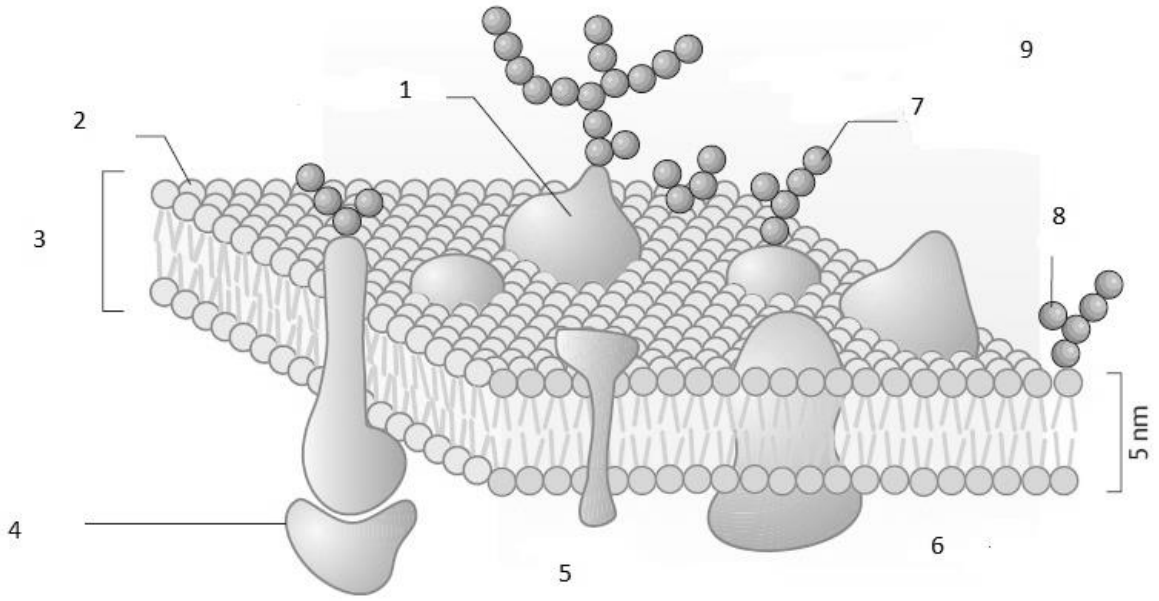
Adenosine _____ Guanine _____ Pyrimidine _____Uracil _____
Thymine _____ Purine _____ Cytosine _____ Adenine _____



1 2 3 4 5 6 7 8

Write the suitable words using words given below:

phospholipid, glycoprotein, extracellular side, oligosaccharide, glycolipid, cytoplasmic side, integral membrane proteins, peripheral membrane protein, lipid bilayer.



1 _____ 2 _____ 3 _____
4 _____ 5 _____ 6 _____
7 _____ 8 _____ 9 _____

PART 6. GENETICS

Read and translate into Ukrainian the following texts:

SOURCES OF GENETIC VARIATION

Selection is probably the most important cause of deviation from Hardy-Weinberg equilibrium because it promotes genetic change in the context of the environment and requires genetic variation. Natural selection can change the frequency of phenotypes, but it must have genetic variation as a raw material to effect change. Where does genetic variation originate? Where do new alleles come from? Genetic variation within populations comes from two main sources: gene flow and genetic drift.

Gene flow. Gene flow is the transfer of genetic material from one population to another. The typically occurs through migration of individuals or movement of seeds or pollen to neighboring populations or, in some cases, to distant populations. For example, the grass *Botriochloa intermedia* seems to have incorporated genes from many other grasses, including *B. ischaemum* in Pakistan, *B. insculpta* in eastern Africa, and *Capillipedium parviflorum* in northern Australia.

Gene flow minimizes geographic variation in gene pools; that is, it decreases genetic differences between populations. Gene flow frequently between neighboring populations, and significantly minimizes the differences between these populations. Gene flow between distant or isolated populations is rare, which allows their gene pools to diverge over time. Reduction in gene flow partially explains why islands isolated by water are geographically more varied and more likely to produce new

species than are vast expanses of grassland, and why lakes and streams contain more geographic variation among populations than oceans. Separated populations of a species are seldom genetically identical, and the differences coincide with the distance between populations.

Gene flow in plant populations is difficult to measure, but it can be experimentally estimated by planting recessive homozygotes at various distances from a strain marked with a dominant allele and then examining the distribution of heterozygous progeny. Using this technique, A. J. Bateman measured pollen dispersal in wind-pollinated (e.g., corn) and insect-pollinated (e.g., radish) crops. The proportion of corn plants receiving the dominant allele by gene flow decreased exponentially with distance and was reduced to 1% at only 13-16 meters from pollen source. Similarly, most pollen of insect-pollinated plants is carried only a short distance; however, the small proportion that is carried farther may contribute importantly to gene flow.

Genetic drift. Genetic drift refers to changes due to chance in the gene pool of a small population. In small populations, chance events such as mutation, mating, or pollination may significantly affect the gene pool and change gene frequencies independently of natural selection. If, for example, one individual in a small population carries the only copy of an allele, then the passage of that allele to the next generation may depend largely on the vagaries of insect pollination or random, lethal storms rather than natural selection. Favorable alleles in a small population can be eliminated by chance alone. Similarly, catastrophic damage to or death of well-adapted individuals may increase the frequency of the alleles of less fit but surviving individuals. Current research indicates that genetic drift may be a more significant force for changing gene frequencies than previously assumed. This would be especially true for the frequencies of genes that are not subjected to heavy selection pressure.

CYTOPLASMIC INHERITANCE

You learned that chloroplasts and mitochondria contain DNA. Genes in these organelles control certain aspects of photosynthesis and respiration, respectively. Inheritance of these genes is independent of sexual reproduction because they are transmitted to offspring with the cytoplasm, usually that of the maternal parent.

One example of cytoplasmic gene control occurs in certain forms of the cultivated four-o'clock (*Mirabilis jalapa*) that have yellowish0white leaves instead green leaves. This difference in leaf color is caused by defective chloroplast genes. Phenotypic expression depends solely on the seed parent. Thus, when pollen from a white-leaved plant is transferred to a green-leaved plant, all the offspring have green leaves. In contrast, all the offspring of the reciprocal cross have white leaves. This is an example of the cytoplasmic inheritance of non-nuclear genes.

The cooperation of organellar and nuclear genes is often necessary for normal metabolism. For example, the photosynthetic enzyme ribulose-1,5-bisphosphate carboxylase/oxygenase has two subunits, one derived from a nuclear gene and one from a chloroplast gene. Similarly, some ATPase's have a dual origin between the

nucleus and mitochondria. In each case, the final product – that is, a complete and functional enzyme – depends on genes from two sources in the same cell.

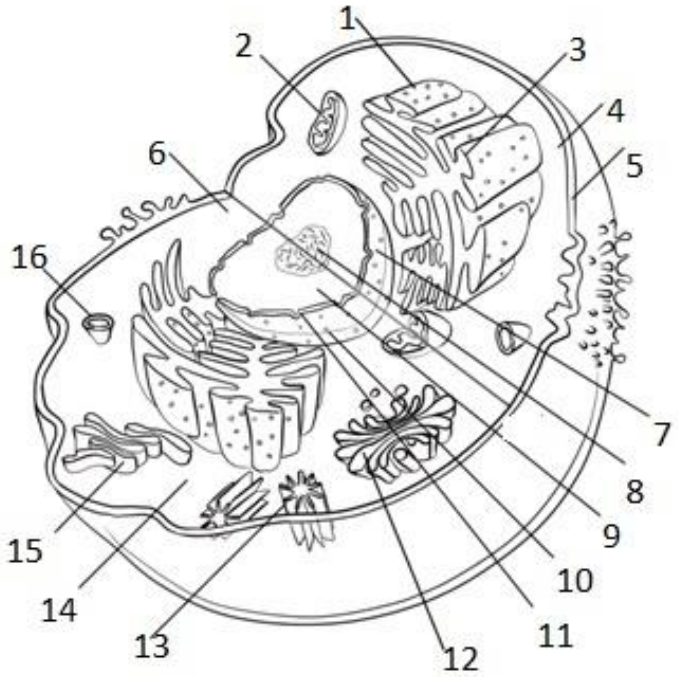
TYPES OF DOMINANCE

The seven genes by Mendel all exhibit complete dominance, which is a relatively rare type of inheritance. Complete dominance occurs when one trait completely masks its recessive allele. More frequently, the phenotype for one allele is only partly masked by the other, a condition called incomplete dominance. Incomplete dominance occurs when hybrids have a phenotype intermediate between those of the two parents. For example, the allele for red flowers in camellia (*Camellia japonica*) is incompletely dominant over the allele for white flowers. As a result, the F_1 offspring is 1:2:1 (25% red, 50% pink, 25% white). Accordingly, in cases of incomplete dominance, the phenotypic and genotypic ratios are the same.

Codominance occurs when both alleles of heterozygote are expressed equally, so there is really no dominance at all. Codominance is common for heterozygous genes that code for two equally functional enzymes. This means that there is more than one form of the same enzyme. The different forms of enzymes made by different alleles of the same locus are called allozymes. Although allozymes catalyze the same reaction, they differ from each other by one or a few amino acids, which make them slightly different from each other in size and overall electric charge. For example, in wild sunflower (Helianthus debilis), there are allozymes of phosphoglucomutase, which catalyzes one of the first reactions in glycolysis. Heterozygotes produce both forms of the enzyme, but homozygotes produce only one or the other.

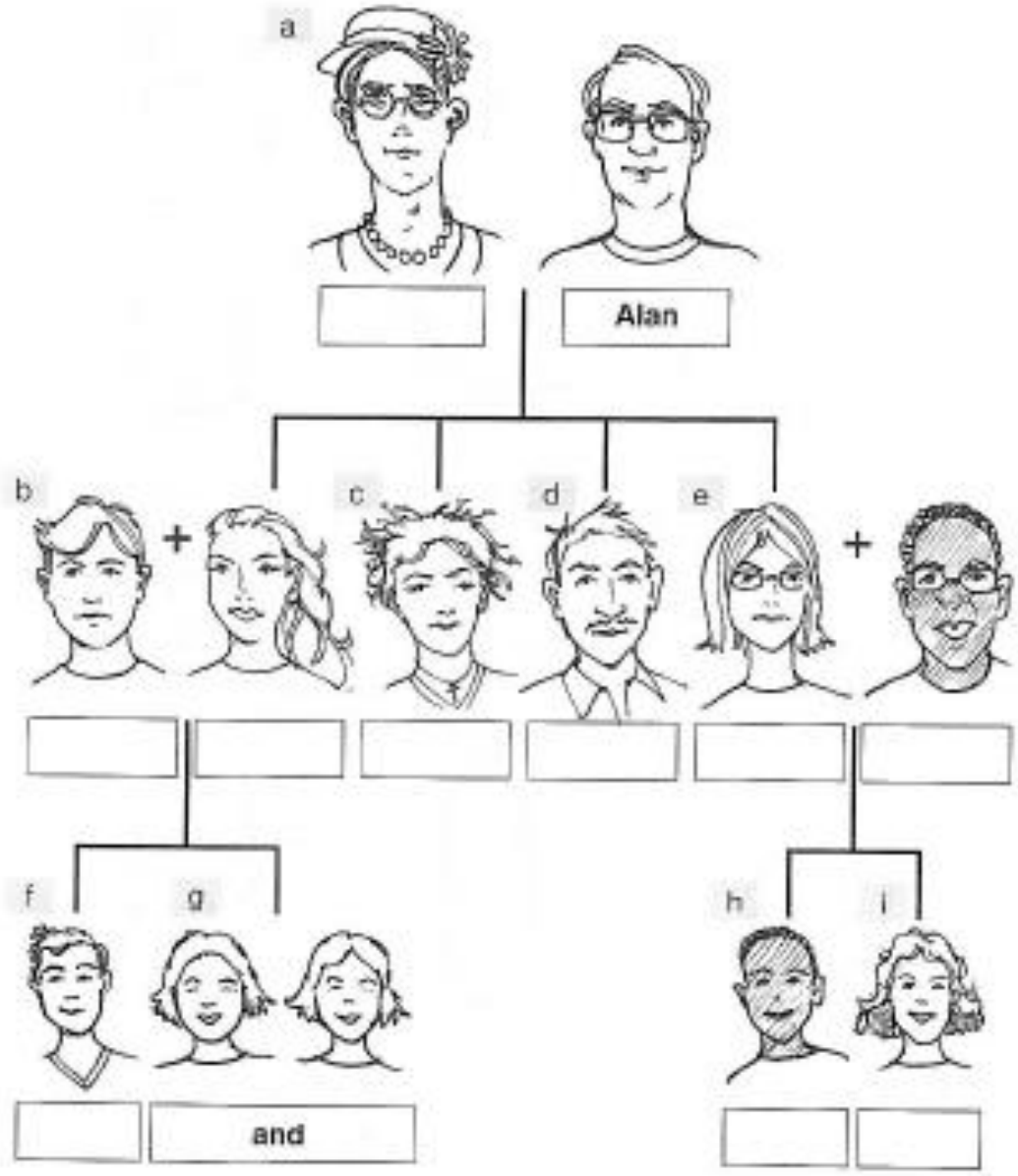
Write the numbers of the corresponding figures.

Cell coat ____centriole ____chromatin ____cytoplasm ____free ribosome ____
Goldi body ____ lysosome _____ mitochondrion _____ nuclear envelope _____
nuclear pore _____ nucleolus _____ nucleus _____ plasma membrane _____
ribosome _____ rough endoplasmic reticulum _____
smooth endoplasmic reticulum _____



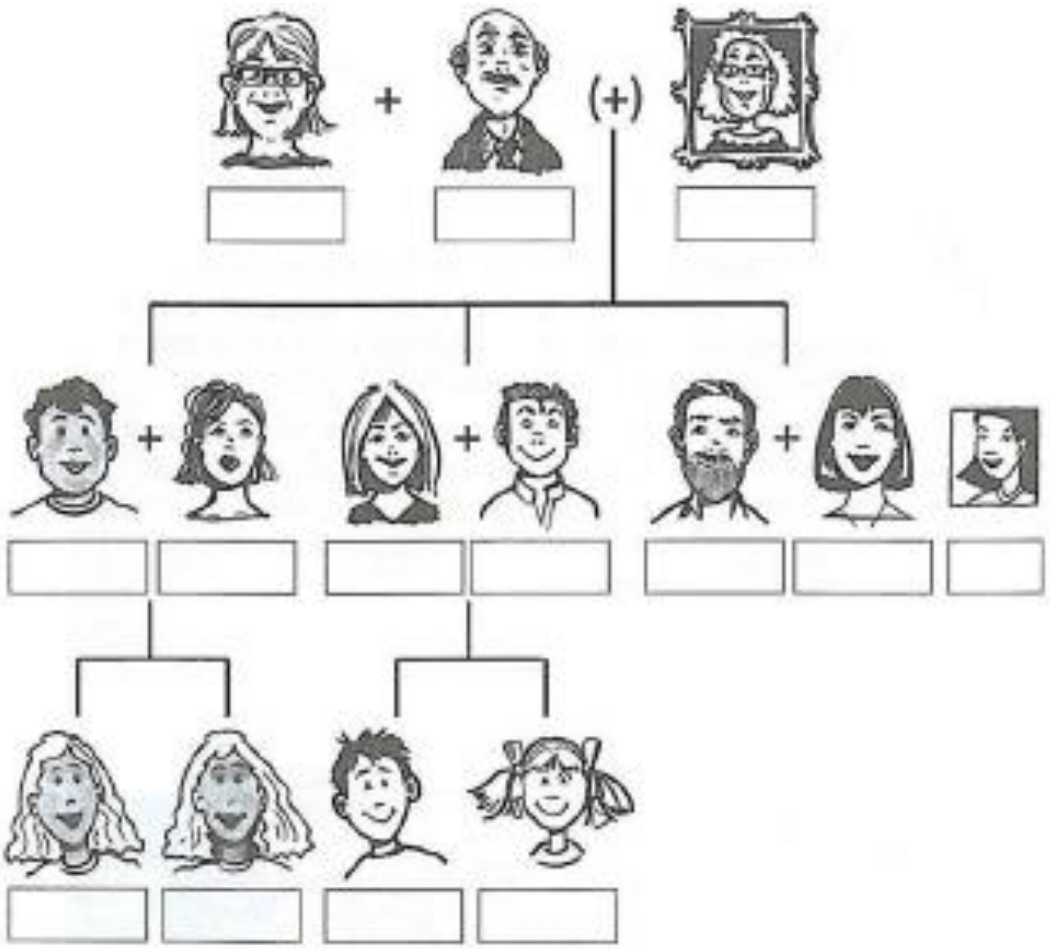
Write the names of the family according to the information below.

My name's Charlotte. I'm married to John. We have two children, Stephen and Sylvia. My mum's name is Theresa and my father is called Alan. I have two sisters and a brother – Emily, Rebecca and Michael. Emily's married to Craig and they have a son called Freddie and twin daughters, Lizzie and Vicky.



Write the names of the family according to the information below.

My name's Heidi. I'm married to Kerim. We have two children, Aisha and Leila. My mum, Wendy, died when I was a teenager. My dad, Keith, got married to Katrina fourteen years ago. I've got one sister, Gina, and one brother, Andy. Gina's married to Kean-Claude, who's French. They've got a little girl called Julie and a boy of twelve called Michael. My brother Andy was married to a girl called Caroline but they got divorced. Luckily they didn't have any children. Now he's married to a girl called Susanna.



РЕКОМЕНДОВАНА ЛІТЕРАТУРА

Основна:

1. Задорожна І.П. Advanced Expository Writing Techniques. Основи англомовного аналітичного письма: Навчально-методичний посібник. Тернопіль : Навчальна книга – Богдан, 2005. 112с.
2. Письменна О.О. Англійська лексика. Інтенсивний курс поповнення словникового запасу. Тернопіль : Навчальна книга – Богдан, 2012. 584с.
3. Письменна О.О. Експрес-довідник із граматики англійської мови. Тернопіль : Навчальна книга – Богдан, 2011. 128 с.
4. Англо-русский биологический словарь. Около 60000 терминов. Москва : Русский язык, 1979. 736с.
5. Бойко О.В. Английский язик. Пенза : Изд-во Пенз. гос. технол. акад., 2007. 54с.
6. Русско-английский биологический словарь: более 35000 терминов. Москва-Минск-Киев : Технические словари, 2000. 524с.
7. Grussendorf M. English for Presentations. Express series. Oxford University press, 2011. 76p.
8. Wallwork A. English for Writing Research Papers. Springler, 2011. 331p.
9. Wallwork A. English for Research: Usage, Style and Grammar. Springler, 2013. 254p.

Додаткова:

1. Бех П.О. Англо-українсько-російський словник біохімічних термінів. Київ : Фітосоціоцентр, 2005. 355с.
2. Wallwork A. English for Academic research: Writing Exercises. Springler, 2013. 199p.
3. Wallwork A. English for Academic research: Vocabulary Exercises. Springler, 2013. 207p.
4. Адамовська Л.М. Прискорений курс англійської мови. Тернопіль : Навчальна книга – Богдан, 2011. 184с.
5. Богацкий И.С. Бизнес-курс английского язика. Словарь-справочник. Київ : Логос, 2002. 352 с.
6. Верба Л.Г. Граматика сучасної англійської мови. Довідник. Київ : ТОВ «ВП Логос-М», 2011. 352с.
7. Письменна О.О. Тематичний екологічний словник. Тернопіль : Навчальна книга – Богдан, 2012. 416с.
8. Письменна О.О. Everyday psychology. Digest. Тернопіль : Навчальна книга – Богдан, 2012. 272 с.
9. Слухинська В.С. Англійська мова для професійного спілкування (для технічних спеціальностей): Навчальний посібник. Тернопіль : Навчальна книга – Богдан, 2009. 120с.
10. Федоришин О.П. Англійська мова. Практикум з науково-технічного перекладу. Тернопіль : Навчальна книга – Богдан, 2002. 52 с.

ВИКОРИСТАНА ЛІТЕРАТУРА

1. Адамовська Л.М. Прискорений курс англійської мови. Тернопіль : Навчальна книга – Богдан, 2011. 184с.
2. Англо-русский биологический словарь. Около 60000 терминов. Москва : Русский язык, 1979. 736с.
3. Бех П.О. Англо-українсько-російський словник біохімічних термінів. Київ : Фітосоціоцентр, 2005. 355с.
4. Богацкий И.С. Бизнес-курс английского язика. Словарь-справочник. Київ : Логос, 2002. 352 с.
5. Бойко О.В. Английский язык. Пенза : Изд-во Пенз. гос. технол. акад., 2007. 54с.
6. Верба Л.Г. Граматика сучасної англійської мови. Довідник. Київ : ТОВ «ВП Логос-М», 2011. 352с.
7. Задорожна І.П. Advanced Expository Writing Techniques. Основи англомовного аналітичного письма: Навчально-методичний посібник. Тернопіль : Навчальна книга – Богдан, 2005. 112с.
8. Зайковські С.А. Ведемо урок англійською мовою: Посібник для вчителя. Тернопіль : Навчальна книга – Богдан, 2011. 48с.
9. Письменна О.О. Англійська лексика. Інтенсивний курс поповнення словникового запасу. Тернопіль : Навчальна книга – Богдан, 2012. 584с.
10. Письменна О.О. Експрес-довідник з граматики англійської мови. Тернопіль : Навчальна книга – Богдан, 2011. 128 с.
11. Письменна О.О. Тематичний екологічний словник. Тернопіль : Навчальна книга – Богдан, 2012. 416с.
12. Письменна О.О. Everyday psychology. Digest. Тернопіль : Навчальна книга – Богдан, 2012. 272 с.
13. Русско-английский биологический словарь: более 35000 терминов. Москва-Минск-Киев : Технические словари, 2000. 524с.
14. Сленг и перевод. (Slang & Translation): учебное пособие. Тернополь : Навчальна книга – Богдан, 2013. 72 с.
15. Слухинська В.С. Англійська мова для професійного спілкування (для технічних спеціальностей): Навчальний посібник. Тернопіль : Навчальна книга – Богдан, 2009. 120с.
16. Федоришин О.П. Англійська мова. Практикум з науково-технічного перекладу. Тернопіль : Навчальна книга – Богдан, 2002. 52 с.
17. Wit&Wisdom Афоризмы и пословицы / Сост.: С.В. Гапонова. Київ : Знання, КОО, 2008. 275 с.
18. Grussendorf M. English for Presentations. Express series. Oxford : University press, 2011. 76p.
19. Wallwork A. English for Academic research: Writing Exercises. Springler, 2013. 199p.
20. Wallwork A. English for Academic research: Vocabulary Exercises. Springler, 2013. 207p.

21. Wallwork A. English for Writing Research Papers. Springler, 2011. 331p.
22. Wallwork A. English for Research: Usage, Style and Grammar. Springler, 2013. 254p.

НАВЧАЛЬНО-МЕТОДИЧНЕ ВИДАННЯ
(українською мовою)

Лях Віктор Олексійович, Бойка Олена Анатоліївна

ПРОФЕСІЙНО-ОРІЄНТОВАНИЙ ПРАКТИКУМ ІНОЗЕМНОЮ МОВОЮ

навчальний посібник для
здобувачів ступеня вищої освіти магістра
спеціальності «Біологія»
освітньо-професійних програм «Біологія» та «Генетика»

Рецензент – *О.І. Васильченко*
Відповідальний за випуск – *В.О. Лях*
Коректор – *О.А. Бойка*