CHAP# 22 Inheritance

S.No	Questions	Answers
3368.	**MENDEL'S LAW OF INHERITANCE**	
3369.	The tendency of individuals to resemble their parents are called	Heredity **ETEA-2018**
3370.	The difference between offspring and their parents are called	Variation
3371.	Heredity and variation play important role in the formation of	New species
3372.	The science which deals with the study of heredity and variation	Genetics
3373.	Genetics are also referred to the study of	Genes
3374.	The science of genetics originated in the year 1900 with the rediscovery of an article originally published in 1866 by an	Augustinian monk named Gregor john Mendel
3375.	The one who successfully explained the mechanism of inheritance during his research work on pea plant was	Mendel
3376.	Mendel was an Austrian monk and is properly known is	Father of genetics
3377.	Mendel was born on July 22, 1822 in	Czech Republic
3378.	Between 1856 and 1863 Mendel carefully analyzing the seven pairs of seed and plant characteristic and cultivated and tested about	28,000 pea plants
3379.	Mendel first delivered his lecture on pea plants in the year of	1865
3380.	Mendel published hi paper "Experiments on plants hybridization" in	1866
3381.	**Later on in 1900, Mendel work was recognized by three investigators:** 1. A Dutch botanist Hugo de Vries 2. De Correns of Germany 3. Tschmarck of Austria	
3382.	The Darwin's theory of evolution was appeared in the year of	1859
3383.	The journal in which Mendel work was republished was	Not recognized
3384.	The scientist of Mendel era was not familiar with the	Statistical analysis of data
3385.	**The main characteristics of plant plants are as follow;** • can be grown in pots or in open area • Short life cycle • Self-pollinating flowers	

- Cross pollination is possible
- Possesses distinct contrasting heritable characters

3386. **Mendel choose seven characters of pea plants for his experiments given below;**

S.No	Character	Dominant trait	Recessive trait
1	Seed shape	Spherical	Wrinkled
2	Seed colour	Yellow	Green
3	Pod shape	Inflated	Constricted
4	Pod colour	Green	Yellow
5	Flower position	Axial	Terminal
6	Flower colour	Purple	White
7	Stem height	Tall	short

3387.	A cross between two individuals that differ with one particular trait is called	Monohybrid cross
3388.	The character that appeared in F_1 generation are called	Dominant character
3389.	The hidden character that appear in F_2 generation are called	Recessive trait
3390.	The offspring of F_1 generation of true red round seed shape plant with true bred wrinkled seed shape will	All round seed shape
3391.	Mendel observed that the recessive character appeared in the F_2 offspring in an average ratio of	3 : 1
3392.	During Mendel's time the study of cytology was in its	Primitive stage
3393.	Mendel visualized the cause of inheritance as	Factors or elements
3394.	Factors/elements was named by Johannsen in 1909 as	Genes
3395.	According to Mendel, each male and female contain a pair of factors and they passed to its offspring only	One factor

3396. **Mendel's work could be represented by laws of heredity. These laws are:**

- Law of dominance
- Law of segregation
- Law of independent assortment

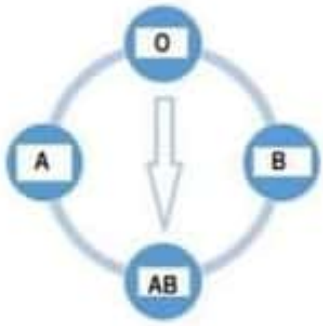
3397.	Dominant allele is represented by	Capital letter
3398.	The recessive allele is represented by	Small letter
3399.	The condition of albinism is characterized by the lack of	Melanin pigment
3400.	Lack of melanin pigment occurs in the	Hair, eyes and skin
3401.	Out of two phenotype the more common is called	Wild phenotype
3402.	The rare form of phenotype is called	Mutant phenotype
3403.	The symbol used to indicate normal allele for wildlife is	+
3404.	According to the law of dominance, different characters are controlled by the	Factors
3405.	Factors are present in pairs, of which one factor	Is dominated over other
3406.	The offspring of two organisms that are particularly different for two traits are called	Dihybrid
3407.	The fundamental law of genetics is called law of	Independent assortment
3408.	The offspring of the RRYY x rryy were all heterozygous with	Round yellow seeds

3409. **Mendel crossed RrYy x RrYy and the result was**

Round yellow	Round green	Wrinkled yellow	Wrinkled green
9	3	3	1

3410.	Two pairs of contrasting traits when followed in a cross, the alleles of one pair assort independently with the alleles of the other pair	Law of independent assortment
3411.	Independent assortment of gene was studied by Mendel in	1865
3412.	Independent assortment of gene occurs during	Meiosis in eukaryotes
3413.	After meiosis occur, each haploid cell contains a mixture of gene from the organism's	Mother and father
3414.	Independents event will occurs simultaneously is the product of their individual probabilities	Product rule
3415.	Probability of an event that can occur in two or more independent ways is the sum of the separate probabilities of the different ways	Sum rule
3416.	If male plant is Pp and female plant is Pp, the probability of heterozygous plant are • product rule → ¼ • Sum rule → ½	
3417.	**EXCEPTION TO MENDELIAN INHERITANCE**	
3418.	**Dominance relation are of the following types:** • Complete dominance → tall;short • Incomplete dominance → 4'o clock plant flower • Co-dominance → blood group AB • Over-dominance → eye colour **ETEA-2018**	
3419.	When one allele is completely dominant over another in heterozygous state is called	Complete dominance
3420.	When neither of the two alleles express independently in heterozygous state is called	Incomplete dominance
3421.	Cross of true breeding red flowered plant with a true breeding white flowered of 4' o clock plant, all the hybrid orbitals are	Pink colour
3422.	**When Corren crossed two pink flowers the result was:** **Red flower: 1 — Pink flower: 2 — White flower: 1**	
3423.	When different alleles of a genes that are both expressed in a hetrozygote condition are called	Co—dominance (blood group)
3424.	When phenotypic expression of heterozygote become more intense than the homozygous state of the dominant allele are called	Over dominance
3425.	Allele which code for one possible outcome of a phenotype are called	Gene
3426.	**ABO BLOOD GROUP SYSTEM**	
3427.	Blood group system was discovered at the university of the Karl Landsteiner in	1901
3428.	ABO blodd group system was found in the humans and apes, chimpanzees, baboons and	Gorillas
3429.	**ABO blood group systems:**	

Blood group type	Antigen	Antibodies	Donors
A	A	B	A, O
B	B	A	B, O
AB	AB	None	A, B, AB, O
O	None	A,B	O

3430.	O blodd group people are universal donors for transfusions 	
3431.	The genetic basis of ABO system in 1925 was discovered by	Bernstein
3432.	ABO blood group system is encoded by the single polymorphic gene "I" on	Chromosomes 9
3433.	**Gene "I" exist in three multiple alleles:** 1. I^A 2. I^B 3. i • I^A and I^B are completely dominant over i. • I^A and I^B are co-dominant over each other.	
3434.	ABO blood type / Genotype A / $I^A I^A$, I^A i B / $I^B I^B$, I^B i AB / $I^A I^B$ A / ii	
3435.	The **main** typs of blood group types	2
3436.	The **major** types of blood group systems are	30
3437.	The **minor** blood group systems(rare blood types) are	More than 200
3438.	**Two main blood group system are:** 1. ABO system 2. Rh(Rhesus) system	
3439.	**Rh blood type** / **Rh factor or Antigen** / **Anti Rh antibodis** / **Donors** / **Genotypes** Rh^+ / Present / Absent / Rh^+ / Rh^- / DD / Dd Rh^- / Absent / Present / Only Rh^- / dd	
3440.	**Rh BLOOD GROUP SYSTEM**	
3441.	The antigen of Rh was discovered in the Rhesus monkey by	Landsteiner in 1930s
3442.	The Rh blood group system currently consist of	50 defined blood groups
3443.	The more common of Rhesus blood groups are	D, C, c, E & e
3444.	The commonly-used terms Rh factor, Rh positive and Rh negative refer to the	D antigen only
3445.	ABO blood type antigens are also secreted by some people in their	Saliva, tears and urine

	body fluids including	
3446.	People which secrete ABO blood type antigens are called	Secretors
3447.	ABO blood group system are controlled by a dominant secretor gene	"Se" on chromosomes 19
3448.	Rh blood group system is encode by three genes C, D & E which occupy	2 tightly linked loci
3449.	Formation of D antigen is commonly known as	Rh factor
3450.	Gene D has two alleles D and d. → Person having genotype "DD" or "Dd" have D antigen (Rh factor) on their RBC and are Rh positive. →person having genotype "dd" do not have Rh factor and are Rh negative.	
3451.	The mother immunity destroy the red blood cells of an Rh-positive foetus, it is called	Erythroblastosis foetalis
3452.	A type of red blood cell which still retains a cell nucleus, it is the immediate precursor of a normal erythrocyte	An erythroblast
3453.	The interaction between the alleles of different pair located on different loci of same or different chromosomes are called	Non-allelic interactions or inter-genic interaction
3454.	**GENE INTERACTIONS**	
3455.	An example of non-allelic interaction is	Epistasis **ETEA-2007**
3456.	The phenomenon in which the effect caused by one gene at one locus interferes with or hides the effect caused by another gene at another locus	Epistasis
3457.	The gene which is suppressed is called	Hypostatic gene
3458.	The gene which is dominant is called	Epistatic gene
3459.	The relation between alleles of same gene on same locus	Dominance
3460.	The interaction between different gene of different loci	Epistasis
3461.	When individual are phenotypically O but genotypically they may be like A, B or AB, this is	Bombay Phenotype **ETEA-2015**
3462.	The Bombay phenotype was first discovered in in 1952 by	Dr. Y.M Bhende
3463.	Bombay phenotype is present about	**0.0004%** (4 per million)
3464.	The maximum possibility of Bombay phenotype is	**0.01%** (1 in 10,000)
3465.	To produce phenotype, genotype interact with	Environment
3466.	Qualitative traits have few phenotypes that have sharp difference so they show	Discontinuous variation
3467.	Quantitative traits comparatively have large number of phenotype small difference so they show	Continuous variation
3468.	**Qualitative traits:**	

S.No	Organism/Part	No of phenotypes	Phenotypes
1	Pea seed shape	2	Round & wrinkled
2	4' O clock flower	3	Red, Pink & Water
3	ABO blood group system	4	A, B, AB & O

Quantitative traits (polygenic traits/multiple gene):

1. Height
2. Weight
3. Intelligence
4. Skin colour

<table>
<tr><td></td><td colspan="2">5. Wheat grain colour</td></tr>
<tr><td>3469.</td><td>All the genes that control quantitative traits are called</td><td>Poly genes</td></tr>
<tr><td>3470.</td><td>Number of population of all phenotypes of wheat population are</td><td>7</td></tr>
<tr><td>3471.</td><td>Most grain have shades in between from</td><td>Light pink to moderately dark red</td></tr>
<tr><td>3472.</td><td>When red green grain is crossed with true breeding white grain the</td><td>Result was light red colour</td></tr>
<tr><td>3473.</td><td>Three different gene pairs, Aa, Bb, Cc at three different loci contribute to the</td><td>Wheat grain colour</td></tr>
<tr><td>3474.</td><td colspan="2">
<table>
<tr><th>Colour</th><th>F_2 generation</th><th></th><th>No of red pigment</th></tr>
<tr><td>Dark red</td><td>1</td><td>AABBCC</td><td>6</td></tr>
<tr><td>Moderately dark red</td><td>6</td><td>AaBBCC, AABbCC, AABBCc</td><td>5</td></tr>
<tr><td>Red</td><td>15</td><td>AABBcc, AAbbCC, AAbbCC</td><td>4</td></tr>
<tr><td>Light red</td><td>20</td><td>AaBbCc, AABbcc,aaBbCC</td><td>3</td></tr>
<tr><td>Pink</td><td>15</td><td>AaBbcc, AabbCc, aaBbCc</td><td>2</td></tr>
<tr><td>Light pink</td><td>6</td><td>Aabbcc, aaBbcc, aabbCc</td><td>1</td></tr>
<tr><td>White</td><td>1</td><td>aabbcc</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>3475.</td><td>Alleles A,B and C codes for an equal amount (dose) of</td><td>Red pigment</td></tr>
<tr><td>3476.</td><td>Environmental factors that can influence the amount of grain colour</td><td>Light, water & nutrients</td></tr>
<tr><td>3477.</td><td colspan="2">Skin colour is largely determined by the Melanin the skin produce. At least three genes regulate the amount of melanin produced;
<table>
<tr><td>Gene A</td><td>Involved in permanent survival, proliferation and migration of melanocytes.</td></tr>
<tr><td>Gene B</td><td>Encodes the enzyme tryosinase which is involved in the production of melanin from tyrosine.</td></tr>
<tr><td>Gene C</td><td>Primarily responsible for determining whether pheomelanin or eumelanin is produced in humans.</td></tr>
</table>
</td></tr>
<tr><td>3478.</td><td colspan="2">Different shades of skin colour:
<table>
<tr><th>Alleles colour shades</th><th>Pigment</th><th>Ratio</th></tr>
<tr><td>Dark brown</td><td>6</td><td>1</td></tr>
<tr><td>Moderate dark brown</td><td>5</td><td>6</td></tr>
<tr><td>Brown</td><td>4</td><td>15</td></tr>
<tr><td>Light brown</td><td>3</td><td>20</td></tr>
<tr><td>Pinkish brown</td><td>2</td><td>15</td></tr>
<tr><td>White brown</td><td>1</td><td>6</td></tr>
<tr><td>Pure white</td><td>0</td><td>1</td></tr>
</table>
*Total combinations: 64</td></tr>
<tr><td>3479.</td><td colspan="2">GENE LINKAGE AND CROSSING OVER</td></tr>
<tr><td>3480.</td><td>The number of gene is greater than number of</td><td>Chromosomes</td></tr>
<tr><td>3481.</td><td>Gene located on same chromosomes that tend to be inherited together in genetic crosses are said to be</td><td>Linked genes</td></tr>
<tr><td>3482.</td><td>The phenomenon of staying together of more than gene on the same chromosomes are called</td><td>Gene linkage</td></tr>
<tr><td>3483.</td><td>If gene are linked on autosomes, their linkage are called</td><td>Autosomal linkage</td></tr>
</table>

3484.	If gene are linked on sex chromosomes, they are called	Sex linkage
3485.	All the linked gene found on the same homologous pair of chromosome form a group, known as	Linkage group
3486.	In humans, the sickle cell anemia, leukemia and albinism are found on	Chromosomes 11
3487.	The linked genes tend to be inherited together and this is	En *bloc* inheritance
3488.	**Detection of gene linkage:** Heterozygous individual(F_1) is crossed with recessive parent(P_1), then if • If all phenotype are produced in equal (1:1:1:1) then there is no linkage between genes. • If more parental and less recombinant are produced then it is incomplete or partial linkage. • If only parental types are produced then tight or complete linkage is believed.	
3489.	**T.H Morgan experiment:** → Normal is dominant over vestigial and gray is dominant over black.	

Body	Wings	Type	Numbers
Gray	Normal	Parental	965
Black	Vestigial	Parental	944
Gray	Vestigial	Recombinant	216
Black	Normal	Recombinant	185

So it is incomplete or partial linkage.

3490.	The process which is responsible for gene recombination of linked gene is	Crossing over
3491.	**Recombinant frequency % = sum of recombinants / sum of combination(parental + Maternal) x 100**	
3492.	The gene that affect the eye colour of drosophila is	Cinnabar (cn)
3493.	**b--------cn----------vg** Distance between: • b and vg → 17% • b and cn → 9% • cn and vg → 9.5%	
3494.	The map units are	Arbitrary
3495.	One map unit is supposed to equal to	1% recombination frequence
3496.	Relationship between allele of the same gene occupying same locus	Dominance
3497.	The interaction between different gene occupying different loci	Epistasis
3498.	**SEX DETERMINATION**	
3499.	**There are wide variety of sex determining mechanisms but three patterns are more common which are:**	

Type	Found in	
XO-XX	Grasshopper and protenor bug	
XY-XX	Drosophila and humans	**ETEA-2016**
XX-XY / WZ-ZZ	Birds, butterflies and moths	**ETEA-2017**

3500.	A trait whose gene is present on X-chromosomes are called	X-linked trait
3501.	A gemmate without any sex chromosomes are called	Nullo gamete

3502.	A gene which is present on X-chromosomes with no counter part on Y-chromosomes are called	X-linked genes
3503.	**Comparison of determination of sex chromosomes of drosophila and human:**	
3504.	An X:A ratio of 1.00 or high produces	Females
3505.	X:A ratio of 0.5 or lower produces of	Males
3506.	**SEX LINKAGE**	
3507.	Morgan showed that the inheritance of eye colour and sex occur in	Coordinate fashion
3508.	SRY genes on Y chromosomes of man determines	Maleness
3509.	Sons do not inherit their father	X chromosomes
3510.		
3511.	Y-linked inheritance is also known as	Holandric inheritance
3512.	Chromosomes Y deletion are frequent genetic cause of a	Male infertility
3513.	In haemophilia the individual are less able to cause	Blood clot
3514.	A chance that a man will inherit the colour blind trait from a carrier mother is	50%

Species	Humans	Drosophila
XX	Female	Female
XY	Male	Male
XO	Sterile Female	Sterile Male
XXY	Sterile Male	Fertile Female **ETEA-2018**

X linked recessive disorders	**X-linked dominant disorders** **ETEA-2010-2013**
Haemophilia A and B	Alport's syndrome
Colour blindness	Coffin – Lowry syndrome (CLS)
Diabetes insipidus	Idiopathic hypoparathyroidism
	Vitamin D resistant rickets