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THRIPP

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Review for Test 3 chapters 8, 26, and 9 — Dr. Baeker

These are some questions to stimulate study: This is not meant to be comprehensive, only a starting point. Study your notes. Study with a partner. Study the textbook. Space provided is to help organize concepts. You may need to make larger tables or flashcards to incorporate all notes.

Know the following terms (everything covered in lecture about the terms):

- Binary fission — bacteria dividing (also archaea)
- Chromatin — relaxed chromosomes in nucleus during interphase
- Chromatid — half of a duplicated chromosome when attached together
- Chromosome "suitcase" for genes — humans have 46 (unduplicated — not chromatids)
- Centromere joining point of 2 chromatids
- Telomere ends of a chromatid
- centrioles make cilia & flagella in animals & non-pollinated plants — line up around nucleus in mitosis
- G1 of interphase of cell cycle Gap 1 — protein synthesis & cell growth
- S of interphase of cell cycle: synthesis (copying) of DNA
- G2 of interphase of cell cycle Gap 2 — same as G1 + prep. for mitosis
- G0 of cell cycle "resting" non-dividing stage: nerve, brain, & spinal cord cells
- Karyotype of males and females 2 sex chromosomes: XX = women, XY = men
- Karyotype of down syndrome, Turner Syndrome, Klinefelter syndrome
- Autosomal chromosomes (autosomes) 44 — 22 pairs — do not determine sex
Trisomy 21 — 3 # 21's XO
- Sex chromosomes 2 of these — determine sex — can be seen on karyotype
- Homologous chromosomes same genes, different alleles (different DNA — variation)
- 23 in humans • Haploid $1N$ — one set of chromosomes — found in germ cells & some plants
- 46 in humans • Diploid $2N$ — two sets of chromosomes — found in all our somatic (body) cells
- Malignant and benign cancers invading neighboring tissues → not invading — staying put
- Metastasis cancerous cells spreading through blood or lymph system
- Somatic versus germ cells: body vs. sex cells, respectively. germ = egg & sperm
- Gametes An egg or sperm cell with one set of chromosomes

Splitting of a cell into 2 during Telophase by cleavage furrow in animals or cell plate in plants

- Cytokinesis
- Recombination → homologous chromosomes exchange DNA by crossing over and splitting up
- Asexual versus sexual reproduction → produces genetic variety by Meiosis & 2 parents → budding, fragmentation
- Hermaphroditic → no sex, good for stable environments
- Organism that has male & female sex organs, i.e. some earthworms
- Spermatogenesis, oogenesis → production of sperm (male) & eggs (female), respectively
- Follicle, FSH → Grows in ovary, contains egg, follicle-stimulating hormone (FSH) which starts ovulation by rupturing the follicle to release the egg
- Corpus luteum, LH → The follicle becomes the corpus luteum after ovulation by a spike in luteinizing hormone (LH), then releases
- Ovulation → Releases ovum. P+E for rest of period

Rupturing of the follicle in the ovary by a spike in FSH & LH. Combination of sperm & egg to make a zygote (diploid) which grows into a baby.

- Fertilization → Releases ovum. P+E for rest of period
- Menstruation → Loss of the endometrium of the uterus every ~28 days → exits vagina. No menstruation when pregnant
- Gregor Mendel → Experimented w/ pea plants discovered complete-dominance genetics.
- Homozygote and heterozygote → AA or aa (same alleles) → Aa (both different alleles)
- Allele → On a gene on a chromosome in a haploid (germ) cell. Inherited randomly in sex
- Simple dominance or dominance or complete dominance versus recessive

Mendel's genetics — AA or Aa have an identical phenotype only aa expresses the recessive

- Incomplete dominance → Extreme by extreme genotype yields intermediate phenotype
- Co-dominance → Heterozygous genotype expresses both phenotypes completely. i.e. AB red white pink blood type is BOTH A & B
- Multiple alleles → more than 2 alleles affect it.

AB blood type
3 or more alleles. ABO blood type system: alleles IA, IB, & i, not just 2

- Pleiotropy → A single genotype affects more than one characteristic. i.e. sickle-cell anemia (ss)
- Polygenic inheritance → The additive affects of two or more genes on a single phenotype
- Genotype → The alleles of the organism. Ex: AA or Aa or aa.
- Phenotype → Influences phenotype depending on the gene (alleles are OR genes).

Observable characteristics of an organism. Influenced by genotype and/or environment.

A few guiding questions. This is not meant to be a comprehensive list.

- 1) What happens to the chromosomes at each stage of mitosis (interphase, prophase, metaphase, anaphase, and telophase)? During which phase is DNA duplicated/copied/doubled? During which phase does the nuclear membrane disassemble/reassemble? When does cytokinesis occur?... ETC. See table below.

Chromosomes move to middle (line up)

PHASE	Chromosome	Nuclear membrane is present/absent	cytokinesis
interphase (S-phase)			
prophase & telophase			

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PMAT

		Assembling or disassembling	
Interphase (G1, S, G2)	1) Relaxed or chromatin; 2) DNA copied during <u>S</u> phase of interphase	Nuclear membrane is present, including nucleolus	Protein synthesis / cell growth
Prophase	Condensing	Disassembling	No cytokinesis
Metaphase	Line up at equator	Absent	"
Anaphase	Move toward poles	Absent	"
Telophase	Relaxing	Assembling	Cytokinesis by furrow or ^{cell} plate

animals plants

2) What are the differences between mitosis in plants versus animals?

	Plants (higher plants with pollen)	Animals
Centrioles (present/absent)	absent	present
Type of cytokinesis	cell plate	cleavage furrow

3) What happens during Meiosis I? all the cool stuff
crossing over, recombination where homologous chromosomes pair up
after M1, ^{human} cells have 23 homologous (duplicated by crossing over - not identical)
What happens during Meiosis II?

Homologous chromosomes split up. The cells (2) split again yielding 4 cells with half the chromosomes of the parent. These are germ cells (sperm or egg) & they are haploid.

4) What are the differences between meiosis and mitosis?

Mitosis is for body (somatic) cells → produces diploid (2N - 2 sets of chroms) cells

Meiosis is for ~~som~~ germ (sperm or egg) cells → produces haploid (1N - 1 set of chroms)

5) What are the functions of the female reproductive organs? (vagina, cervix, uterus, cells for oviduct or fallopian tube, ovary).

Sexual reproduction

	Function
Vagina	Birth canal - receives sperm & baby exits through

in childbirth

Cervix	Narrow neck at end of vagina/start of uterus
Uterus	The womb — a fertilized egg grows into a baby here
Oviduct/fallopian tube	The ovum is fertilized by sperm here — egg beat moves to uterus by cilia
Ovary	Grows a follicle, releases egg, follicle becomes corpus luteum & regulates ovarian cycle w/ P+E

moves to uterus by cilia in oviduct

6) What are the functions of the male reproductive organs? (testes, epididymis, vas deferens, prostate, Cowper's gland, seminal vesicles, urethra).

	Function
Testes (w/ seminiferous tubules)	Sperm cells are made in the seminiferous tubules. Testes are in the scrotum (external) to stay cooler.
Epididymis	Sperm cells are stored & matured here.
Vas deferens	Sperm cells exit the epididymis through this tube during ejaculation.
Prostate	Makes alkali for semen to neutralize acid in vagina
Cowper's gland	Produces lubricating fluid for the urethra before ejaculation
Seminal vesicles	Feed sugar to the sperm ("last-bag lunch")
Urethra	Serves both urination & ejaculation through the penis

7) What are the functions of the head (acrosome and chromosomes), mid piece, tail of a sperm?

	Function
Head with Acrosome and chromosomes	Modified lysosomes; eats through jellylike layer around ovum
Middle piece	Mitochondria to make ATP for energy
Tail	A long flagellum for movement. 

(centrioles make cilia + flagella)

8) What are the different methods of birth control? How do they prevent pregnancy?

Method	What is the method and how prevents pregnancy
Birth control pill	Daily pill - prevents ovulation w/ synthetic P+E.
Vasectomy	Cutting & tying of the vas deferens (men).
Tubal ligation	Cutting & tying of the fallopian tubes (women).
Rhythm	Avoiding sexual intercourse during ovulation
Withdrawal or Coitus Interruptus	The man pulls out before ejaculation.
Condom (male)	Barrier method - plastic sheath covers penis to catch semen.
Diaphragm	Goes in vagina to block cervix
Spermicide	Chemicals that kill sperm

- HEV, herpes, warts → candidiasis (yeast)
- 9) Know which diseases are viral, bacterial, fungal and protozoan (Protista)? (see table 26.2) → Trichomoniasis
- 10) Which diseases can you treat with antibiotics? [answer: BACTERIAL diseases are treated with antibiotics] Which diseases can you treat with anti-fungal chemicals? → Chlamydia infections, gonorrhea, syphilis
→ fungal infections (yeast)
- 11) What do genes encode? Does every cell have the same genes? Does every cell express the same genes? → polypeptides (proteins) ~~Yes~~ → Yes
- 12) If a cell has four chromosomes before mitosis, how many chromosomes are found in each cell after mitosis? 4 After meiosis? 2
- 13) How many different gametes can a diploid cell with the genotype "Aa" produce? 2: A or a (egg/sperm = gamete)

See Genetics Problems handouts and study crosses and pedigrees.

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SUPPLEMENTAL INSTRUCTION FOR SURVEY OF BIOLOGY by Richard X. Thripp

Week 11, Fall 2009, Nov 10 / 11 / 12. Genetics Ch. 9. daytonastate.org/biology

- 1.) Gregor Mendel discovered genetics (basically) by crossing pea plants.
- 2.) A phenotype is the observable characteristics of an organism (phenomenon).
- 3.) A genotype is the combination of alleles in an organism (think genome).
- 4.) Which of these is visible on a karyotype? (Circle) blue eyes skin color Turner syndrome
- 5.) An allele is a variation of a gene or alternate forms of a gene.
- 6.) The phenotype can be influenced by the genotype and/or the environment.
- 7.) A diploid organism has ONLY 2 alleles per genotype.
- 8.) One allele comes from each parent to make an allele pair (the genotype).
- 9.) A pure-breed purple-flowered pea plant (AA) crossed with a pure-breed white-flowered pea plant (aa) yields all purple flowers (white is recessive).
#16)
$$\begin{array}{c} I^A \quad i \\ I^B \quad \begin{array}{|c|c|} \hline I^A I^B & I^B i \\ \hline I^A i & ii \\ \hline \end{array} \\ i \end{array}$$
- 10.) #9 is an example of complete (simple) dominance.
- 11.) In simple dominance, AA expresses the exact same phenotype as Aa.
- 12.) In incomplete dominance, long-tail mates with no-tail giving short-tailed cats.
- 13.) A white mouse mates with a black mouse, yielding a mouse who has pure-black hairs and pure-white hairs. This is an example of codominance.
- 14.) What two blood types ALWAYS have the same genotype? (Circle) O AB A B
- 15.) I^A - means the blood type (phenotype) is A but the ^{genotype} alleles could be $I^A I^A$ or $I^A i$.
- 16.) The man has A blood type ($I^A i$ genotype) and the woman has B blood type ($I^B i$ genotype).
What phenotypes can their children have? (Circle) O AB A B [make a Punnett sq. on the back]
- 17.) When yellow aliens have the aa genotype for the Zypibob gene, they are purple, live ten times longer, and grow twice as tall. This is an example of pleiotropy.
- 18.) Human height is an example of polygenic inheritance (affected by 2+ genes).