BIOLOGY 1

WORKSHEET IV

Selected Answers

(Circulation, Respiration, Excretion, and Reproduction)

1. Describe the difference between the systemic and pulmonary circuits.

The systemic circuit is the pathway of blood from the heart to the body.
The pulmonary circuit is the pathway of blood between the heart and the lungs.

2. Describe at least 3 differences between arteries and veins.

Arteries	**Veins**
Carry blood away from the heart	Carry blood toward the heart
Have thicker walls	Have thinner walls
Lack valves	Have valves

3. Place these terms in correct order: heart, venules, arteries, capillaries, veins, arterioles.

See diagram from lecture notes

4. Place these terms in correct order: pulmonary artery, pulmonary veins, bicuspid valve, tricuspid valve, aorta, lungs, tissues, right atrium, left atrium, right ventricle, left ventricle

Memorize pathway of blood flow through the heart before you try to do this!

5. Describe the relationship between the structure of capillaries and their function.

The walls of a capillary are one cell thick and composed of this flat cells. Capillaries are the site of diffusion of oxygen from the lungs to the blood and from the blood to the tissues. It is easier for things to diffuse across a structure that is thin than a structure that is thick.

6. Define:

A. Hypertension: High blood pressure

B. Myocardial infarction: Heart attack

C. Cardiac Output: The volume of blood pumped by the heart in one minute.

Cardiac Output = Heart Rate X Stroke Volume

Note that stroke volume is the volume of blood pumped by the left ventricle when it contracts.

D. Systolic blood pressure: The maximum blood pressure during ventricular contraction.

E. Arteriosclerosis:

This term refers to a cardiovascular disease associated with high blood cholesterol levels. High cholesterol is associated with fatty deposits (plaque) on the artery walls. This causes a narrowing of the artery walls and plaque may eventually block and artery or stimulate the formation of a blood clot. Thus arteriosclerosis is associated with heart attacks and strokes.

8. What affect do the following factors have on heart rate?

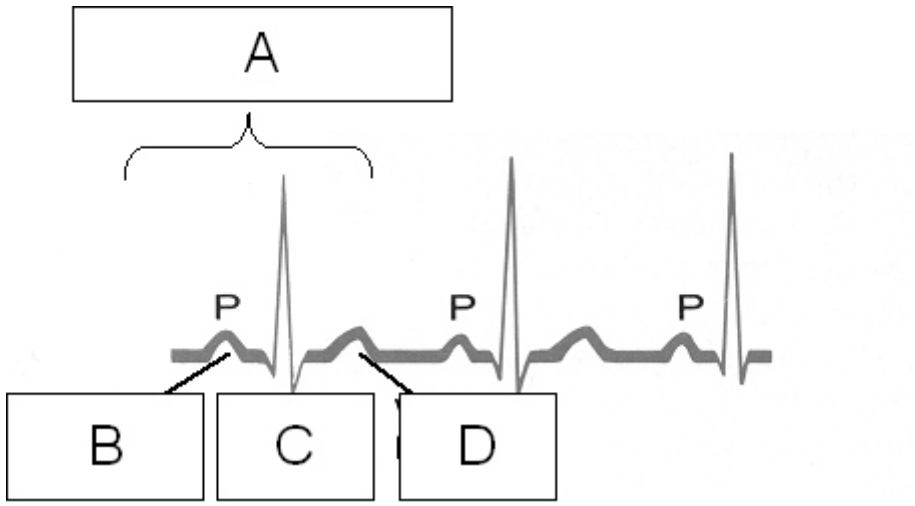
a. Sympathetic stimulation: Increases heart rate

b. Parasympathetic stimulation: Decreases heart rate

c. Fever: Increases heart rate

d. Hypothermia: Hypothermia refers to a low body temperature which decreases heart rate.

9. Identify A - D on the following diagram:



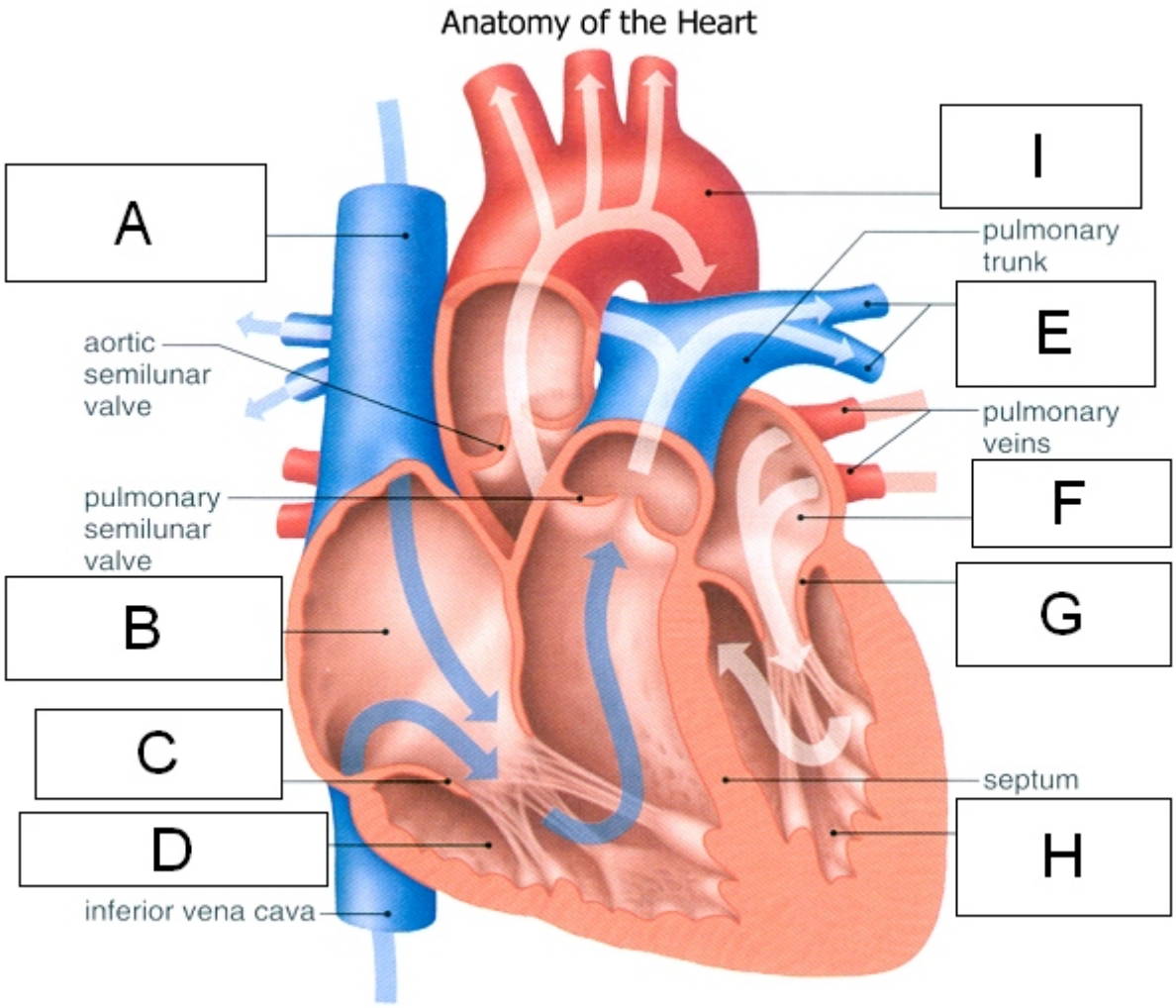
A. One cardiac cycle or one heart beat. An average person has 70 heart beats per minute.

B. P - Wave = Atrial Contraction

C. QRS Complex = Ventricular Contraction

D. T-Wave = Ventricular Relaxation

10. Identify A - I on the following diagram:



A. Vena Cava
B. Right Atrium
C. Tricuspid Valve
D. Right Ventricle
E. Pulmonary Artery
F. Left Atrium
G. Bicuspid Valve
H.. Left Ventricle
I.. Aorta

11. Explain the role of the diaphragm and the intercostal muscles in inhalation and exhalation.

Inhalation: The diaphragm contracts and pulls down. The external intercostals contract and raise the ribs up. This increases the volume of the thoracic cavity and decreases the air pressure in the thoracic cavity. This causes air to move into the lungs.

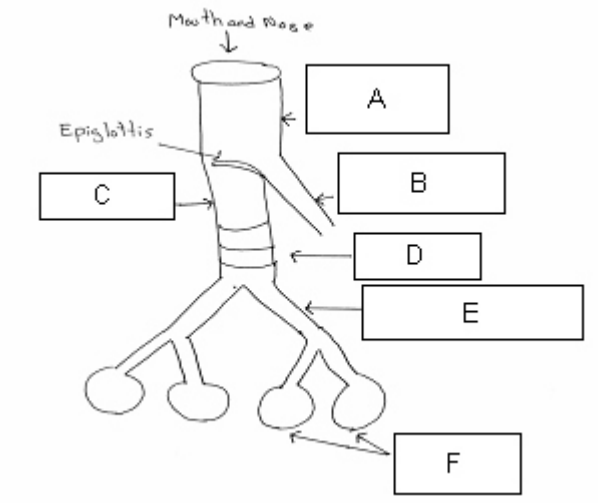
Exhalation: The diaphragm relaxes and moves up. The internal intercostals contract and pull the ribs down. This decreases the volume of the thoracic cavity which increases the air pressure in the thoracic cavity. This forces air out of the lungs.

12. Using the following terms construct a flow chart of the passageways that conduct air from the environment to the tissues.

You need to memorize respiratory anatomy before you do this!

A.	Mouth	H.	Pharynx
b.	Epiglottis	I.	Trachea
C.	Alveoli	J.	Pulmonary Capillaries
D.	Bronchi	K.	Tissues
E.	Bronchioles	L.	Left Atrium
F.	Bicuspid Valve	M.	Left Ventricle
G.	Pulmonary Veins	N.	Larynx

13. Identify A - F on the following diagram:



A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

14. **Matching**

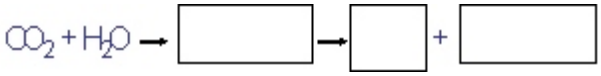
----------a.	Site of gas exchange between lungs and blood	1. Alveoli
----------b.	Voice box	2. Blood Oxygen Levels
----------c.	Wind pipe	3. Blood CO_2 Levels
----------d.	An increase in elevation is accompanied by a/an_____ in atmospheric pressure	4. Boundary Layer 5. Decrease 6. Desert Iguana 7. Diabetes 8. Diffusion
----------e.	Process that enables gas exchange	9. Eccritic 10. Ectothermic 11. Endothermic 12. Hypothermia
----------f.	Primary factor that controls respiratory rate	13. Increase 14. Larynx 15. Poikilothermic
----------g.	Still layer of air that surrounds any object	16. Trachea 17. Zebra
----------h.	Primary source of body temperature is metabolism	
----------I.	Range of temperatures in which energy expended in thermoregulation is minimal	
----------j.	Low body temperature	
----------k.	Disease associated with high blood glucose levels	
----------l.	Animal with high critical thermal maximum	
----------m.	Term to describe an animal with a fluctuating body temperature	

15. If a person has a respiratory rate of 15 breaths per minute and tidal volume of 500 ml per breath, what would be their pulmonary ventilation?

PV = _____ X _____ = _____ml/min

15 breaths/minute X 500 ml/breath = 7,500 ml/minute

16. Complete the following equation:



H_2CO_3 H^+ HCO_3^+

17. Is behavior important to thermoregulation? Explain.

It is very important to ectothermic animals such as lizards. When a lizard is cold it will sit on a warm rock and gain heat by conduction. It will also orient its body to the sun to gain heat by solar radiation. If a lizard gets too hot it will seek shade to reduce heat gain by solar radiation. It will also press its belly in cool sand in the shade to lose heat by conduction. If it is too hot in the shade the lizard will escape heat by retreating to an underground burrow.

18. Define torpor. How does torpor differ from hibernation?

Torpor is a short term lowering of body temperature. By lowering the body temperature the animal lowers its metabolic rate and its need for food (energy). Small animals that have a huge surface area exposed to cold air in relation to body mass often enter torpor **overnight** to reduce the energy needed to get the animal through the night. Some examples of animals that do this are hummingbirds and a small mouse called the white-footed deer mouse (*Peromyscus maniculatus*).

19. Define the following terms: These are in you lecture notes. The terms were also define in laboratory number 5 - *Cellular Respiration and Metabolic Rates.*

A. Radiation _____
B. Conduction _____
C. Convection _____
D. Evaporation _____
E. Ectothermic _____
F. Endothermic _____
G. Poikilothermic _____

20. Why is a lizard able to maintain a fairly constant body temperature in nature, yet its body temperature is equal to cage temperature in the laboratory.

When a lizard is in a cage it cannot behaviorally regulate its temperature like it can in the wild. See number 17 to see how a lizard behaviorally regulates its temperature.

21. Give at least two reasons why it an advantage to be an ectotherm in a desert environment? Explain.

Ectotherms have low metabolic rates. The lower the metabolic rate the less an animal needs to eat. Since there is limited photosynthesis in the desert due to lack of water there is not as much food available in deserts as many other ecosystems. The low metabolic rate means the animal does not need as much to eat.

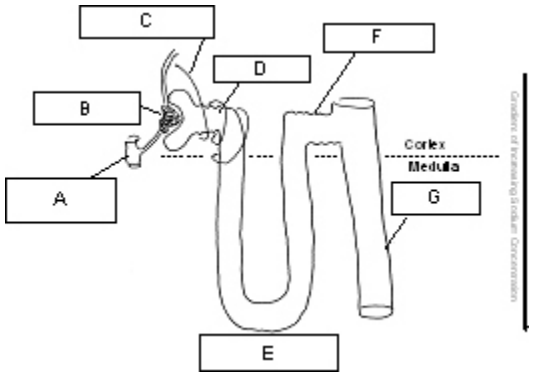
Endotherms not only need to eat more than ectotherms, they also produce lots of heat internally. Thus on a hot day they are gaining heat from solar radiation, radiation, and conduction. In addition they are producing heat internally (i.e they have their furnace on!). The only way they can maintain body temperatue is to evaporatively cool and lose lots of water or avoid the heat by staying in an underground burrow on a hot day.

The metabolic rate of an ectotherm is so low that the internal furnace is off. Thus they only need to deal with heat gained from the environment. Internal heat production is not an issue on a hot day.

22. List adaptations found in the following desert animals that enable existence in such a harsh environment. **You had to be in lecture to answer these questions!**

Animal	**Adaptation**
Horned lizard	_____
Kangaroo rat	_____
Kit fox	_____
Antelope ground squirrel	_____
Desert tortoise	_____

23. Identify A - G on the following diagram:



See you lecture notes!

24. Metabolism of proteins results in the production of nitrogenous wastes. What are the primary nitrogenous wastes produced in:

a. Fishes? Ammonia

b. Birds? Uric acid

c. Reptiles? Uric acid

d. Mammals? Urea

e. Amphibians? Urea

25. What effect does antidiuretic hormone (ADH) have on:

a. The collecting duct?

It makes it more permeable to water. This promotes the absorption of water from the collecting duct back into the blood stream. This means that less water ends up in urine and water is conserved by the body.

b. Urine output? ADH decreases urine output (You pee less!)

26. Name the following regions of the kidney:

A. Site of active sodium reabsorption: Proximal Tubule

B. Site of glucose reabsorption Proximal Tubule

C. Site of action of ADH (Antidiuretic Hormone) Collecting Duct

D. Major site of filtration Glomerulus/Nephron Capsule

E. Major site of water reabsorption Proximal Tubule

F. Site where urine output is controlled Collecting Duct

G. Part of nephron that creates a gradient of increasing sodium concentration from the cortex to the medulla.

Nephron Loop (Loop of Henle)

27. Define the following terms:

A. Endometrium

The lining of the uterus. This is where the fertilized egg implants. The endometrium is sloughed off when a woman is having a menstrual cycle

B. Follicle: The ovum (egg) and the cells that surround it

C. Semen: Semen contains sperm, secretions from the seminal vesicle, and secretions from the prostate gland

D. Corpus luteum:

The corpus luteum forms from the empty follicle that is left behind after ovulation. It secretes the hormone progesterone. This hormone causes a small increase in body temperate. Thus a woman's temperature is slightly higher after ovulation.

E. Osteoporosis: "Thinning of the bones". Women experience bone loss during menopause due to a decrease in blood estrogen levels

28. How does the hypothalamus exert control over the pituitary gland?

By secreting a chemical called GnRH. This chemical turns the pituitary on and stimulates it to secrete FSF (Follicle Stimulating Hormone) and LH (Luteinizing Hormone)

29. Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) are secreted by the _____ gland. These hormones act on the _____ in the female.
Pituitary Ovary

30. What is the endometrium and what is its function?

The inner lining of the uterus. It is where a fertilized egg implants

31. What is fertilization and where does it usually occur?

Fertilization occurs when a sperm cell penetrates and egg cell and dumps its DNA into the egg cell. Fertilization takes place inside the fallopian (uterine) tube

32. List the pathway sperm follows from the testes to the female vagina.

Seminiferous tubules in testes - epididymis - vas deferens - urethra - vagina

33. List the pathway an unfertilized egg follows from the ovary to the exterior of the vagina.

Ovary - fallopian (uterine) tube - body of the uterus - cervix (lower 1/3 of uterus) - vagina

34. What two hormones are necessary for ovulation? What endocrine gland secretes these?

FSH (Follicle Stimulating Hormone) and LH (Luteinizing Hormone)
These hormones are secreted by the pituitary gland

36. List three components of semen.

Semen contains sperm, secretions from the seminal vesicle, and secretions from the prostate gland

37. List the functions of:

a. the interstitial cells:

These are cells in the testes that are located between the seminiferous tubules. They secrete testosterone.

b. the endometrium

The lining of the uterus. This is where the fertilized egg implants. The endometrium is sloughed off when a woman is having a menstrual cycle

c. the seminiferous tubules: The site of sperm production in the testes

d. the scrotum:

The scrotum houses the testes and functions in temperature regulation of the testes. The scrotum contains muscles which can pull the testes up towards the body cavity when cold, or can relax so the testes hand down below the body

e. the gonads: Produce sex hormones and gametes. The ovaries are the female gonads and the testes are the male gonads

38. Matching:

12	a._____Site of fertilization	1.	Body of penis
19	b._____Site of sperm production in testes	2.	Clitoris
11	c._____Site of testosterone production in testes	3.	Codominance
8	d._____Lining of the uterus	4.	Corpus luteum
9	e._____Finger-like projections surrounding ostium of fallopian tube.	5.	Cowper's gland (Bulbourethral gland)
		6.	Diploid
16	f._____Release of eggs from ovary	7.	Hymen
18	g._____Temperature regulation of testes	8.	Endometrium
5	h._____Secretes pre-ejaculatory fluid	9.	Fimbriae
2	I._____Homologous to glans penis in female	10.	Haploid
1	j._____Homologous to labia minora in male	11.	Interstitial cells
7	k._____Membrane that covers vaginal opening	12.	Fallopian tubes
4	l._____Develops from ruptured follicle	13.	Genotype
14	m._____Process that produces haploid gametes	14.	Meiosis
10	n._____Number of chromosomes in gametes	15.	Mitosis
6	o._____2N number of chromosomes	16.	Ovulation
10	p._____ N number of chromosomes	17.	Phenotype
		18.	Scrotum
		19.	Seminiferous tubules