

LSEP_1_T2_Revision exercise_Ans

1. According to Poiseuille's Law, a small decrease in the radius of a blood vessel results in:
- A. a large increase in blood viscosity.
 - B. a large increase in resistance to blood flow.**
 - C. a small decrease in blood viscosity.
 - D. a small decrease in resistance to blood flow.
 - E. a small decrease in total blood vessel length.

Lecture 6: P. 17-21

Resistance to flow is inversely proportional to the 4th power of the radius (r^4) of the blood vessel. When radius decrease, resistance increase a lot.

2. The blood flow through blood vessel A is 10 ml/s. If the blood pressure remains the same and the radius of blood vessel A is doubled, the new blood flow of blood vessel A would be:
- A. 2.5 ml/s.
 - B. 5 ml/s.
 - C. 20 ml/s.
 - D. 40 ml/s.
 - E. 160 ml/s.**

Lecture 6: P. 10, 19-21

Blood flow = pressure / resistance, the higher the pressure, the faster the flow rate, the higher the resistance, the slower the flow rate. Also resistance is proportional to the 4th power of the radius of the vessel. When radius doubles, resistance decrease to 1/16 of the original resistance. Therefore, the flow rate will be increased by 16 times given the pressure is unchanged.

3. What is the velocity of blood flowing through a blood vessel with cross sectional area of 4 cm² at a flow rate of 80 ml per second?
- A. 5 cm per second
 - B. 20 cm per second**
 - C. 40 cm per second
 - D. 80 cm per second
 - E. 120 cm per second

Lecture 6: P.15

Velocity = flow / cross sectional area & 1 ml = 1 cm³

4. Cardiac output divided by heart rate equals:
- A. blood pressure.
 - B. blood flow.
 - C. stroke volume.**
 - D. total peripheral resistance.
 - E. velocity of blood flow.

Lecture 6: P.4

*Cardiac output (L/min) is the volume of blood pumped by a ventricle per unit time
= stroke volume (ml) x heart rate (beat per min)*

Stroke volume is the volume of blood pumped by a ventricle per beat

5. Blood pressure
- A. decreases when blood viscosity increases.
 - B. decreases when cardiac output increases.
 - C. increases when blood vessels of the body dilate.
 - D. increases when total peripheral resistance increases.**
 - E. increases when stroke volume decreases.

Lecture 6: P.4

Blood pressure = cardiac output(CO) x total peripheral resistance (TPR)

BP increases when CO and/or TPR increase.

Option A: TPR increases with blood viscosity increases – lecture 6: P.17

Option C: TPR decreases when blood vessels dilates – lecture 6: P.20-21

Option E: CO increases when stroke volume increases – lecture 6: P.4

6. What is the partial pressure of oxygen (with a relative abundance of 21%) if the total atmospheric pressure is 690 mmHg?
- A. 69 mmHg
 - B. 145 mmHg**
 - C. 210 mmHg
 - D. 545 mmHg
 - E. 760 mmHg

Lecture 7: P.11-12

Partial pressure of a gas mixture like atmosphere = total gas pressure (690 mmHg in this case) X % of the gas in the mixture (21% in this case)

7. What is the partial pressure of CO₂ (with a relative abundance of 0.3%) if the total gas pressure is 550 mm Hg?
- A. 1.65 mmHg**
 - B. 16.5 mmHg
 - C. 55 mmHg
 - D. 110 mmHg
 - E. 165 mmHg

Lecture 7: P.11-12

Partial pressure of a gas mixture like atmosphere = total gas pressure (550 mmHg in this case) X % of the gas in the mixture (0.3% in this case)

8. According to Boyle's law, at a constant temperature, the volume of a gas _____ as the pressure on the gas _____.
- A. decreases; decreases
 - B. increases; decreases**
 - C. increases; increases
 - D. remains unchanged; increases
 - E. remains unchanged; decreases

Lecture 7: P.15-16

Pressure and volume of a gas in a system are inversely related ($P_1V_1 = P_2V_2$)

9. According to Fick's first law of diffusion, solute moves:
- A. from a region of high concentration to low concentration.**
 - B. from a region of low concentration to high concentration.
 - C. from a region with negative charge to positive charge.
 - D. from a region with positive charge to negative charge.
 - E. from the extracellular region to intracellular region.

Lecture 7: P.13

10. Rate of diffusion of a solute increases when
- A. the concentration gradient decreases.
 - B. the diffusion distance increases.
 - C. the solute is less soluble.
 - D. the temperature decreases.
 - E. the total surface area for diffusion increases.**

Lecture 7: P.13

Rate of diffusion increases with (1) increase in concentration gradient, (2) decrease in diffusion distance, (3) increase in solubility of the diffusing solute, (4) increase in temperature (particles move faster when temp. increases) and (5) increase in total surface area.

11. Which of the following statements best describes homeostasis?
- A. Keeping the internal environment of the body in a fixed and unaltered state.
 - B. Keeping the composition of intracellular fluid in a dynamic equilibrium.
 - C. Altering the external environment to accommodate the body's needs.
 - D. Maintaining a near-constant internal environment.**
 - E. It is achieved through positive feedback mechanisms.

Lecture 8: P.4, 7, 15-16

Option A: the internal environment is not keep fixed but a regulated variable within predictable range

Option B: the internal environment refers to the extracellular fluid

Option C: external environment is not altered

Option E: Homeostatic control is under negative feedback regulation

12. Which of the following is an example of physiological processes under positive feedback control?
- A. Formation of blood clot.**
 - B. Effect of glucose level of glucagon secretion.
 - C. Effect of blood pressure changes on heart rate.
 - D. Effect of oxygen level on erythropoietin secretion.
 - E. Regulation of body temperature.

Lecture 8: P.35

Examples of positive feedback control are (1) coagulation cascade (i.e. blood clotting); (2) childbirth and (3) LH surge after follicular phase of menstrual cycle.

13. Synthesis and release of most hormones is regulated by negative feedback control. Negative feedback means:
- A. a rise in hormone levels affects the target organ which act to inhibit further hormone release.**
 - B. a rise in hormone levels affects the target organ which act to stimulates further hormone release.
 - C. hormonal level is kept at a constant level.
 - D. neural stimuli regulate the release of hormones.
 - E. the effect of hormones on the target organ does not control further hormone release.

Lecture 8: P.29-31

14. Chemical signals that can only travel and act at a limited distance between different cells is known as
- A. autocrine signalling.
 - B. endocrine signalling.
 - C. hormonal signalling.
 - D. paracrine signalling.**
 - E. neural signalling.
15. Secreted chemicals that act on the secreting cell itself or same type of cells nearby is known as
- A. autocrine signalling.**
 - B. endocrine signalling.
 - C. hormonal signalling.
 - D. paracrine signalling.
 - E. neural signalling.
16. Secreted chemicals which travels in the blood stream to act on cells far away from the secreting cells is known as
- A. autocrine signalling.
 - B. endocrine signalling.**
 - C. hormonal signalling.
 - D. paracrine signalling.
 - E. neural signalling.

Q14-16 – Lecture 8: P.23

17. Which of the following organelles breaks down unwanted intracellular materials?
- A. Golgi apparatus
 - B. Lysosome**
 - C. Mitochondrion
 - D. Nucleus
 - E. Rough endoplasmic reticulum
18. Which organelle is connected to the nucleus?
- A. Golgi apparatus
 - B. Lysosome
 - C. Mitochondrion
 - D. Peroxisome
 - E. Rough endoplasmic reticulum**
19. Which organelle has ribosomes attached?
- A. Golgi apparatus
 - B. Lysosome
 - C. Mitochondrion
 - D. Nucleus
 - E. Rough endoplasmic reticulum**
20. What is the function of ribosomes?
- A. ATP synthesis
 - B. DNA replication
 - C. Lipid synthesis
 - D. Protein synthesis**
 - E. DNA transcription
21. Which organelle contains DNA?
- A. Golgi apparatus
 - B. Mitochondrion**
 - C. Peroxisome
 - D. Rough endoplasmic reticulum
 - E. Smooth endoplasmic reticulum
22. What is the function of centriole?
- A. Duplication of DNA before cell division.
 - B. Organize spindle fibers for separation of chromosome during cell division.**
 - C. Read the message on RNA for production of protein synthesis.
 - D. Removal of hydrogen peroxide.
 - E. Synthesis of RNA using DNA as template.
23. Which of the following organelles is common to prokaryotic and eukaryotic cells?
- A. Lysosome
 - B. Ribosome**
 - C. Mitochondrion
 - D. Peroxisome
 - E. Smooth endoplasmic reticulum

24. Which of the following organelles are abundant in cells responsible for producing steroid hormones?
- A. Ribosomes and lysosomes
 - B. Mitochondria and ribosomes
 - C. Smooth endoplasmic reticulum and Golgi apparatus**
 - D. Rough endoplasmic reticulum and Golgi apparatus
 - E. Rough endoplasmic reticulum and lysosomes

Q17-24 – Lecture 9

25. Which of the following correctly describes glycocalyx?
- A. Components of the glycocalyx are important markers for cell-cell recognitions and communication.**
 - B. Components of the glycocalyx are important for controlling traffics of molecules across membrane.
 - C. It consists of the lipid moieties of membrane glycolipids and glycoproteins.
 - D. It consists of proteins coating the external surface of plasma membrane.
 - E. It consists of proteins coating the internal surface of plasma membrane.

Lecture 10: P.8

Glycocalyx is the carbohydrate moieties of membrane glycolipids and glycoprotein that coat the external surface of plasma membrane. They are specific biological markers and are responsible for cell-cell recognition, communication and intercellular adhesion.

26. Which of the following is required for facilitated diffusion to take place?
- A. Carrier carbohydrate
 - B. Carrier proteins**
 - C. Energy
 - D. Enzymes
 - E. Na^+/K^+ ATPase

Lecture 10: P.16-17

Facilitated diffusion requires channel proteins or carrier proteins to help small lipid-insoluble molecules (e.g. ions) and large polar molecules (neutral molecules with uneven charge distribution over their surfaces like glucose) to cross the membrane.

27. Osmosis refers to movement of _____ across a selectively permeable membrane from a solution of _____ to a solution of _____.
- A. solute particles; higher concentration; lower concentration.
 - B. solute particles; lower concentration; higher concentration.
 - C. water molecules; “higher water concentration”; “lower water concentration”.**
 - D. water molecules; “lower water concentration”; “higher water concentration”.
 - E. water molecules; higher concentration; lower concentration.

Lecture 10: P.18-19

28. The principle extracellular cation is
- A. Na^+**
 - B. K^+
 - C. Ca^{2+}
 - D. Cl^-
 - E. HCO_3^-

Lecture 10: P.23

The principle extracellular cation (positively charged ion) is Na^+ due to the action of Na^+/K^+ ATPase that is present in all body cells. It actively pumps 3 Na^+ out of and 2 K^+ into the cells.

29. Endocytosis is used by cells to
- A. ingest bacteria and cell debris.**
 - B. secrete large molecules into the extracellular space.
 - C. secrete ions into the extracellular space.
 - D. take up nutrients.
 - E. remove waste products.

Lecture 10: P.25-26

Endocytosis moves large particles and macromolecules from extracellular space into the cell (e.g. ingestion of bacteria and cell debris by phagocytes) and endocytosis moves them from the cell into the extracellular space (e.g. secretion of protein).

30. Which of the following types of molecules cross membrane by simple diffusion?
- A. Charged molecules.
 - B. Large molecules.
 - C. Lipid-soluble molecules.**
 - D. Macromolecules.
 - E. Polar molecules.

Lecture 10: P.15

Option A – charge molecules move by facilitated diffusion (e.g. ions, amino acid) or active transport (ions)

Option B – large molecules pass move by facilitated diffusion

Option D – macromolecules move by endocytosis or exocytosis

Option E – polar molecules move by facilitated diffusion

31. Which of the following substances can directly pass through the lipid bilayer of the cell membrane?
- A. Amino acid
 - B. Glucose
 - C. Na^+
 - D. O_2**
 - E. Protein

Lecture 10: P.15

Amino acid and Na^+ are charged, glucose is polar, protein is a macromolecule

SAQ

1. A typical eukaryotic cell consists of plasma membrane, cytoplasm and nucleus.
- (a) Briefly describe the structure of the plasma membrane.
 - (b) What are the functions of plasma membrane?
 - (c) DNA can be found in which intracellular structure(s)?
 - (d) Which organelle is physically connected to the nucleus?
 - (e) Which organelle is considered the powerhouse of the cell?
 - (f) Name TWO spherical organelles with single membrane that contain enzymes.

Ans

(a) Plasma membrane is composed of a phospholipid bilayer with proteins embedded or adhere to the lipid bilayer

*(b) As barrier to separate the intracellular from extracellular constituents
To control entry and exit of substances into or out of the cell (semi-permeable)
Membrane proteins confer various functions to the plasma membrane
E.g. cell adhesion, recognition, receptors to detect chemical signals...*

(c) The nucleus and the mitochondria

(d) The rough endoplasmic reticulum

(e) Mitochondrion

(f) Lysosome and peroxisome

2. Cytoskeleton consists of network of protein filaments that extend throughout the cytoplasm.
- Name the THREE types of protein filaments that makes up the cytoskeleton.
 - List the THREE functions of cytoskeleton.

Ans

- Microfilaments, microtubules and intermediate filaments*
- Provide structural framework for the cell (maintain cell shape)*
Movements of the entire cell (e.g. movement of white blood cell across vessel wall to site of inflammation)
Transport of substances within the cells (intracellular transport)

3. Cilium and flagellum are hair-like organelles on cell surface.
- Briefly describe the structure of cilium and flagellum.
 - What are the differences between cilium and flagellum?
 - Give an example of cilium and flagellum.

Ans

- Both are composed of 9 pairs of microtubules arranged around a central pair (9+2 arrangement)*
-

	<i>Cilium</i>	<i>Flagellum</i>
<i>Length</i>	<i>Short</i>	<i>Long</i>
<i>Number</i>	<i>Numerous along the entire surface of plasma membrane</i>	<i>Usually 1 or a few on a cell</i>
<i>Function</i>	<i>Move substances along the outer surface of membrane</i>	<i>Move the entire cell</i>

- Cilium – lining of the respiratory tract*
Flagellum – tail of the sperm