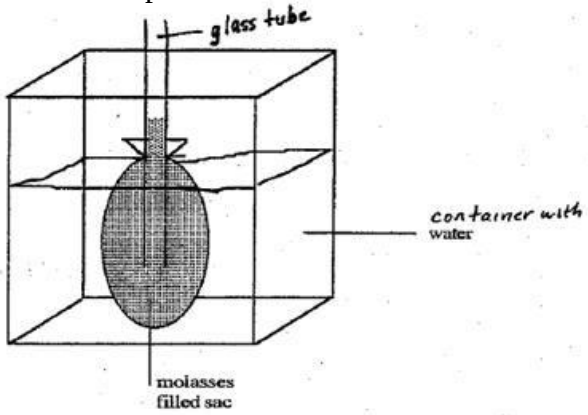
BIOLOGY HOMEWORK FOR S5 MCB&PCB

1. A pouch into which an open glass tube is inserted is filled with molasses. The molasses extends a short distance up the tube. The pouch and tube are then put in a container of water. The membrane is permeable to water but impermeable to molasses.

* The glass tube is supposed to be very long, so the solution in the bag (pouch will not rise up the tube + overflow into the container.



. 1. Which particle(s) is(are) in random, kinetic motion?

A. Molasses B. water C. both D. neither

. 2.Which particle(s) will move through the membrane of the pouch?

A. Molasses B. water C. both molasses and water D. neither molasses nor water

3. Movement of particles across the membrane is the result of

A. Osmosis B. active transport C. energy use D. neither osmosis nor diffusion

4. After 24 hours, the size of the pouch will probably be

A. Smaller B. Larger C. the same D. unable to be determined

. 5. After 24 hours, the container will contain

A. Water only C. both water and molasses
B. molasses only D. neither water nor molasses

6. After 24 hours, the pouch will contain

A. Water only C. both water and molasses
B. molasses only D. neither water nor molasses

7. After 24 hours, the level of the liquid in the glass tube

A. Will be lower C. will be the same
B. Will be higher D. cannot be determined

2. *Amoeba*, a single celled protist, has a specialized structure called a contractile vacuole whose function is to collect excess water from the cell and discharge this water into the environment. From this information you can deduce that *Amoeba* lives in an environment that is (*hypertonic*, *isotonic*, *hypotonic)* to the cytoplasm of *Amoeba*. Thus, you would expect to find *Amoeba* living in:

A. a freshwater pond B. the ocean C. Great Salt Lake D. a bottle of unpasteurized milk

3. *In the following situations, you are given some information. You must supply the rest.*

I. Identify the <u>type of solution</u> the cell has been placed into (isotonic, hypotonic or hypertonic).

II. Shot the <u>resulting direction of water movement</u> (into the cell, out of the cell or equal movement in or out of the cell) in or out of the cell.

1) A cell with 3% solute is placed into a solution of 5% solute.

_____% solute _____% salt The solution is _____

Water will move

_____% water _____% water _____

2) A cell with 20% solute is placed into a solution of 20% solute.

_____% solute _____% salt The solution is _____

Water will move

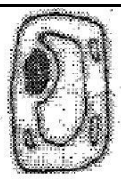
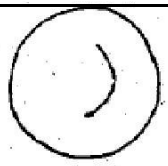
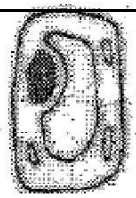
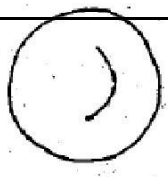
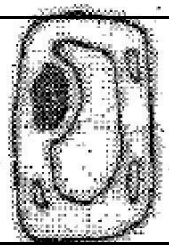
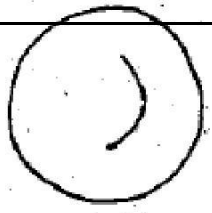
_____% water _____% water _____

4) A cell with 80% water is placed into a solution of 95% water.

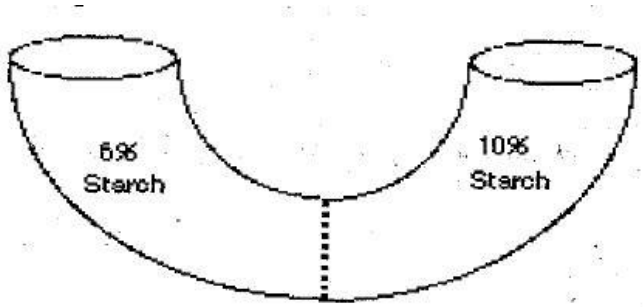
_____% solute _ solute _____% The solution is _____

_____% water _____% water Water will move _____

4. *Diagram what the cells would look like after being placed in the environment shown*

Conditions	Plant Cell (leaf cell)		Animal Cell (blood cell)	
Environment	Before	After	Before	After
Isotonic solution:				
Hypertonic Solution				
Hypotonic Solution				

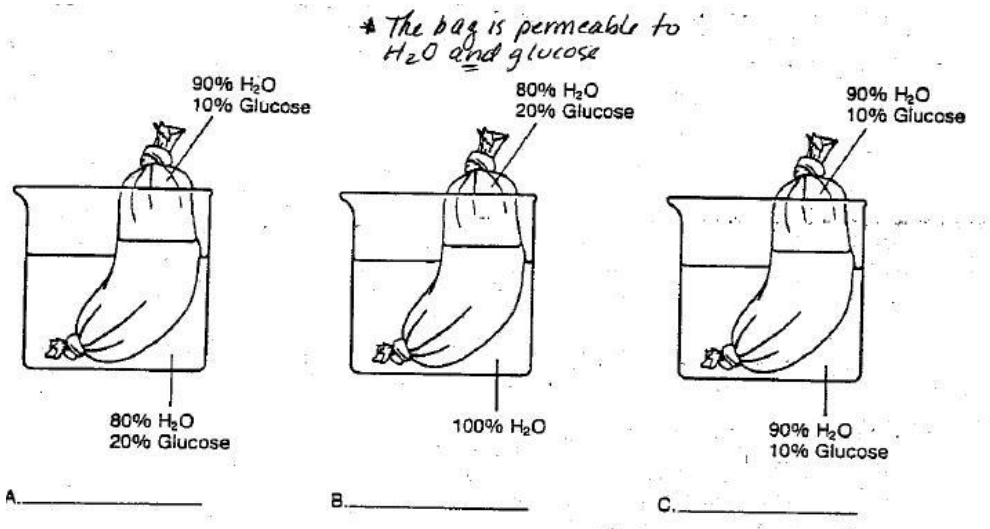
5. The U-tube in the figure below is divided in the middle by a membrane that is impermeable to starch put permeable to water. A 10% starch solution is put into the right-hand half of the tube and an equal amount of 6% starch solution is put into the left-hand half of the tube.



6. In this solution:
   a. Water will move from the right to the left
   b. Water will move from the left to the right
   c. Starch will move from the right to the left
   d. Water will move in both directions, but more from left to right than right to left
   e. Water will move in both directions, but more from right to left than left to right

7. Carrot sticks that are left in a dish of freshwater for several hours become stiff and hard. Similar sticks left in a salt solution become limp and soft. From this we can deduce that the cells of the carrot sticks are
   a. Hypotonic to both freshwater and the salt solution
   b. Hypertonic to both freshwater and the salt solution
   c. Hypertonic to freshwater but hypotonic to the salt solution
   d. Hypotonic to freshwater but hypertonic to the salt solution
   e. Isotonic with freshwater but hypotonic to the salt solution

8. The direction in which water molecules move during osmosis depends on where the water molecules are more highly concentrated. Study the diagrams below. Decide whether the solution in each beaker is hypotonic, isotonic, or hypertonic in relation to the solution inside the cellulose bag. Draw arrows to indicate the direction in which the water will move in each case. *The bag is permeable to H_2o and glucose.



1. Intravenous solutions must be prepared so that they are isotonic to red blood cells. A 0.9 percent salt solution is isotonic to red blood cells.

A. Explain what will happen to a red blood cell placed in a solution of 99.3 percent water and 0.7 percent salt.

B. What will happen to a red blood cell placed in a solution of 90 percent water and 10 percent salt? Explain.

2. What keeps plant cells from bursting when they are placed in a hypotonic solution

3. How does being placed in a hypertonic solution affect a plant?

4. In regard to the solutions in the bags and in the beakers, what is meant by equilibrium?

5. What happens to the motion of molecules after equilibrium is reached?

What are the functions of the nucleic acids?

9. a) What is the monomer of the nucleic acids?

b)What is the polymer of the nucleic acids?

c)What is the function of DNA?

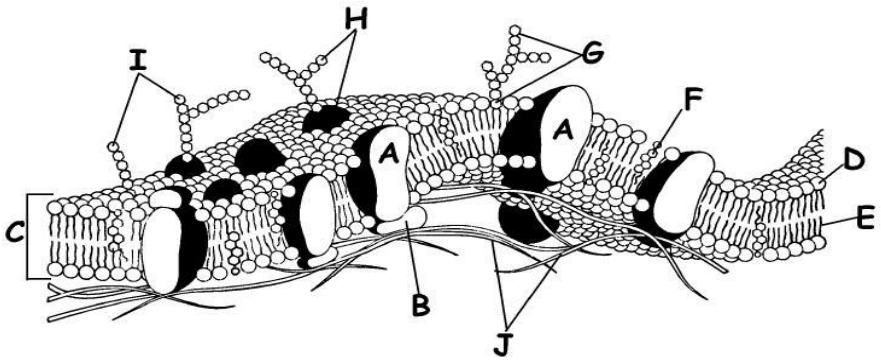
d)What is the function of RNA

e) What is the function of ATP?

f) Where is DNA located in a cell?

10. What is a chromosome?

11. a) Fill the gaps by using letters from the diagram



_____ cholesterol

_____ cytoskeleton

_____ Glycolipid

_____ Glycoprotein

_____ hydrophilic end of phospholipid

_____ hydrophobic end of phospholipid

_____ integral protein

_____ lipid bilayer

_____ oligosaccharides

_____ peripheral protein

b) List possible functions of membrane proteins. (Give at least 3 possible functions.)

12. a) DNA was extracted from cells of Staphylococcus and found to have 37% cytosine. What percent of guanine does this species have?

b) What percent of thymine does this species have?

13. a)Why is the sodium-potassium transport mechanism called a "pump"?

b)Explain how a phagocyte could be used to destroy bacteria.

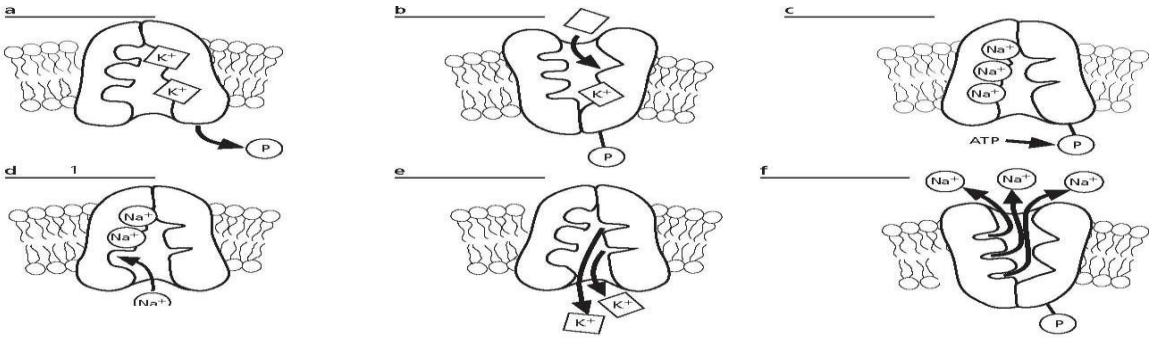
c) Describe how a cell produces and releases proteins. (Fill in the blanks below)

Proteins are produced at the_____ they are transported through the _____, they are packaged into a vesicle at the ___, if they are to be exported out of the cell the vesicle travels to the cell membrane and ___ occurs- releasing the contents of the vesicle out of the cell.

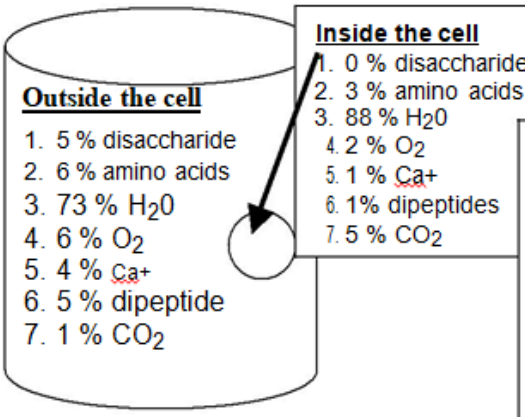
14. The diagrams below represent the six steps in one cycle of the sodium-potassium pump. The order of the steps has been scrambled. Beginning with diagram d (numbered 1), sequence the remaining diagrams by writing the appropriate numeral in each blank. d, c, f, b, a, e

a) On which side of the membrane are Na+ ions released from the pump? (circle one) inside or outside

b) On which side of the membrane are K+ ions released from the pump? (circle one) inside or outside

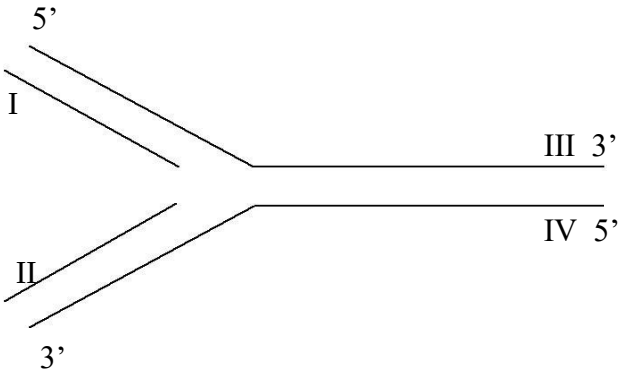


15. Fill the gaps with appropriate terms from above in the table



	(into or out of)	(diffusion, osmosis, facilitated diffusion, ion channel)
a. Disaccharides move	_____	the cell by _____
b. Amino Acids move	___ ____	the cell by _____
c. Water moves	_____ _____	the cell by _____
d. Oxygen moves	_____	_the cell by _____
e. Ca+ ions move	_____	_the cell by _____
f. Dipeptides move	_ ____	the cell by _____
g. Carbon dioxide moves	_____	the cell by _____

16. The mechanism of DNA replication is studied in an E. coli replication fork. (Questions A-J)



A. Which is a characteristic of this replication fork?

a) Strand I is replicated continuously while strand II is replicated discontinuously.

b) Strand III is a lagging strand template while strand IV is a leading strand template.

c) The double-helix containing strands I and III must be denatured in order for replication to continue.

d) The double-helix containing strands II and IV will form base-pairs using phosphodiester bonds.

B. Which is a property of Okazaki pieces in an E. coli replication fork?

a) Okazaki pieces are joined together by DNA polymerase I to form a long chain.

b) Okazaki pieces are polymerized in the 3′→5′direction by DNA polymerase III.

c) An Okazaki piece for the leading strand is polymerized to a length of 1000-2000 nucleotides.

d) An Okazaki piece for the lagging strand has a base sequence complementary to its template.

C. Which is a property of RNA primers in an E. coli replication fork?

a) RNA primers are synthesized using a DNA template and NDPs.

b) Each RNA primer is joined to an Okazaki piece through a non-covalent bond.

c) Each RNA primer is both polymerized and degraded in the 5′→3′ direction.

d) RNA primers are synthesized and proof-read by the primase enzyme.

D. When will this fork stop replicating DNA?

a) when its movement is halted by a Ter sequence

b) when it is denatured by the Tus protein

c) when it reaches the OriC region

d) when a topoisomerase removes supercoils

E. Which is a characteristic of an E. coli replication fork and a eukaryotic replication fork?

a) Both forks contain a leading strand and a lagging strand.
b) Polymerization occurs more rapidly in eukaryotes.
c) Okazaki pieces are smaller in prokaryotes.
d) Both forks can synthesize DNA only during S phase.

F. Which is a characteristic of E. coli DNA polymerases?

a) Pol I functions as a multimeric protein that participates in DNA repair.
b) Pol I functions as a core enzyme that clamps around the DNA.
c) Pol III functions as a holoenzyme that polymerizes DNA with high processivity.
d) Pol III functions as a single polypeptide chain that can form phosphodiester bonds.

G. Which property is shared by E. coli DNA polymerase I and DNA polymerase III?

a) Both enzymes require a template that can be either DNA or RNA.
b) Both enzymes require a primer that can be either DNA or RNA.
c) Both enzymes can use pyrophosphate as a substrate.
d) Both enzymes can make and break N-glycosidic bonds.

H. Which describes the role of primase during replication?

a) It catalyzes the formation of phosphodiester bonds using NTPs as substrates.
b) It coordinates synthesis of the leading strand and the lagging strand.
c) It functions as a holoenzyme that polymerizes in the 3'→ 5'direction.
d) It uses an exonuclease activity to remove incorrect nucleotides.

I. Which function can be carried out by DNA replication proteins?

a) Topoisomerases wind the DNA into a double-helix.
b) DNA ligase can initiate new DNA chains
c) SSB converts double-stranded DNA into single-stranded DNA.
d) Helicases break hydrogen bonds in the DNA.

17. A difference between prokaryotes and eukaryotes is seen in the organization of heir genetic material.

a. Discuss the organization of the genetic material in prokaryotes and eukaryotes.
b. Contrast all of the following activities in prokaryotes and eukaryotes:
- DNA replication

- transcription OR translation
- gene regulation
- cell division

18. a)Protein synthesis is vital for cell growth and metabolism.
b)Describe transcription and translation.
c)Identify similarities between transcription and translation.
d)Identify differences between transcription and translation.
e)Describe structural changes that can occur in a protein after translation to make it function properly.

19. How the phagocytosis takes place in the immune system of cells?

20. Describe the uptake of cholesterol by the mammalian cells using receptor-mediated endocytosis.

21. What is protein trafficking? Explain with an example.

22. What is transcytosis? Explain with an example.

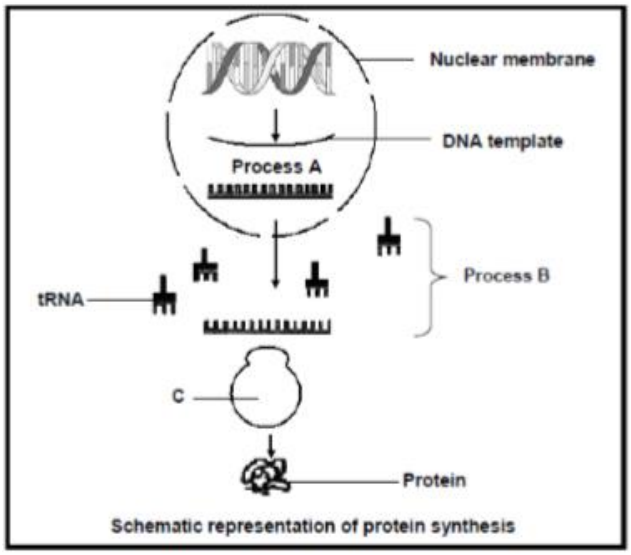
23. What are the two types of exocytosis? Explain with a schematic diagram.

24. True or False. If the answer is False, change the underlined word(s) to make the statement true

_____ _____	1)	The sugar found in RNA is called <u>deoxyribose</u>.
_____ _____	2)	The DNA molecule is double stranded and the RNA molecule is <u>single</u> stranded.
_____ _____	3)	The process of <u>translation</u> occurs at the ribosome.
_____ _____	4)	The job of <u>mRNA</u> is to pick up amino acids and transport them to the ribosomes.
_____ _____	5)	<u>Transcription</u> must occur before <u>translation</u> may occur.

25. Tabulate the differences between DNA and RNA

26. The diagram below represents protein synthesis. Study the diagram and answer the questions that follow.



Schematic representation of protein synthesis

Name the following processes:

(a) A

(b) B

(c) Describe how the mRNA is made from the DNA template during process A.

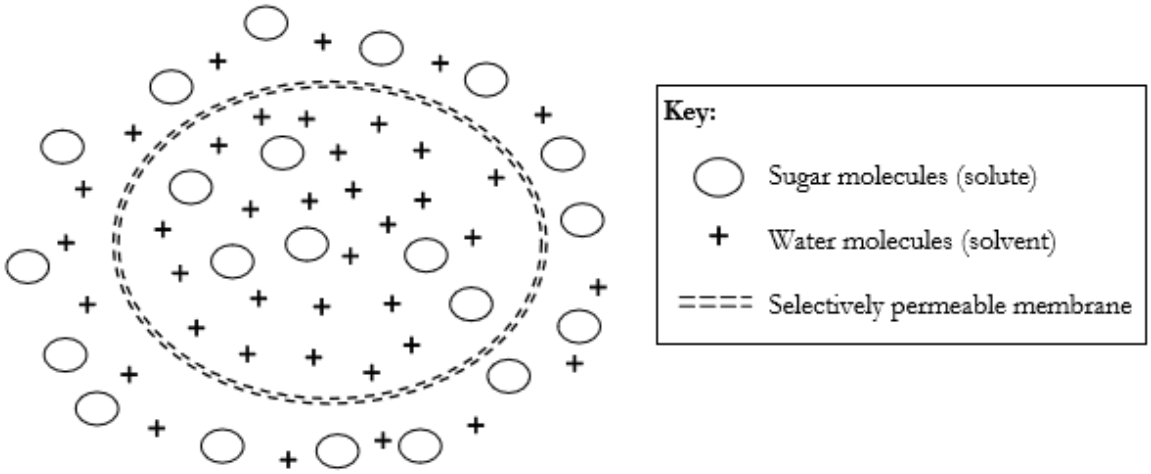
27. The questions below are based on protein synthesis.

a) Describe the role of DNA during transcription in protein synthesis.

b) The diagram below shows the sequence of nitrogenous bases of a small part of a strand of DNA which codes for part of a protein molecule. CGG TAT CCT

c) Write down the mRNA codon sequence that reads from left to right from the DNA sequence above.

28. Model 2 shows a cell bounded by a selectively permeable membrane. There is a sugar solution inside the cell and outside the cell.

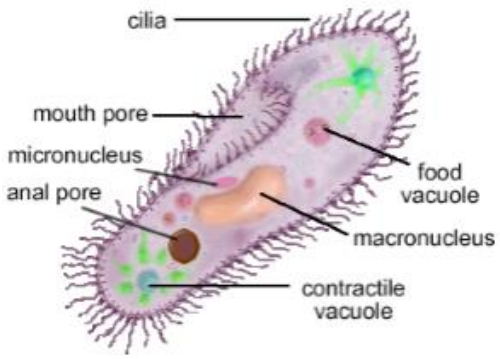


a. Which side of the membrane has a more concentrated sugar solution? Inside/outside

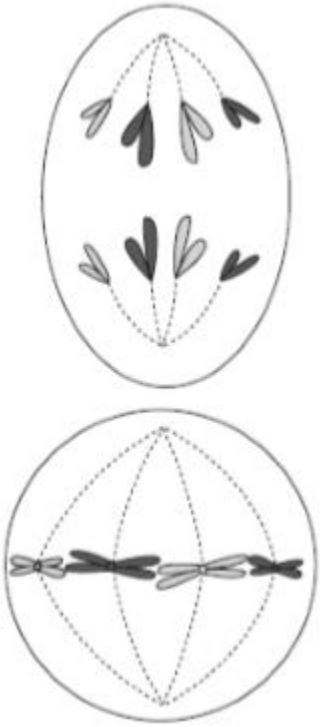
b. In a concentrated solution there is more/less water.

c. Which side of the membrane has a more dilute sugar solution? Inside/outside

29. The diagram shows a single-celled organism called Paramecium, which lives in freshwater environments. This organism contains a specialized organelle called a contractile vacuole that helps maintain osmotic balance. Predict how this organelle might help the organism survive given that it is constantly immersed in a hypotonic solution.



30. The diagrams below show two stages of mitosis in cells. Draw one straight line from each diagram to its correct description.



chromosomes shorten and thicken
chromosomes line up at the centre of the cell
chromatids are pulled to opposite ends of the cell
nuclear membrane reforms

b) How does mitosis ensures that daughter cells will be able to function properly

DO IT CAREFULLY & CONSULT POSSIBLE DOCUMENTS

HOPE THAT THIS TIME WILL BE FRUITFUL