







Name: KEY

SCIENCE 10

Year-End Review

UNIT A: CHEMISTRY

1. Write the missing label or draw the missing picture for each WHMIS symbol below.

	Exploding bomb (for explosion or reactivity hazard)		Flame (for fire hazard)		Flame over circle (for oxidizing hazard)
					Skull and Crossbones (can cause death or toxicity with short exposure to small amounts)
	Health hazard (may cause or suspected of causing serious health effects)				
					

2. Identify the element at each of the following locations on the periodic table:

a) Group 1, Period 2 Li

c) Group 7, Period 5 Tc

b) Group 4, Period 6 Hf

d) Group 16, Period 7 Luh

3. Give the name & characteristics of each group below

- a. Group 1: Alkali metals - extremely reactive metals; form +1 charged
 b. Group 2: Alkaline earth - metals are reactive; form +2 ions
 c. Group 17: Halogens - extremely reactive non-metals; form 1- ions.
 d. Group 18: Noble gases - least reactive elements; do not form ions

4. Three unknown elements demonstrate the following properties:

Property	Element A	Element B	Element C
State of matter	Solid	Solid	Gas
Conductivity	High	Medium	Low

Classify each element as a metal, non-metal, or metalloid. Justify your answer.

Element A Metal

Element B metalloid

Element C Non-metal

5. For each atomic model pictured below, write the name of the scientist who proposed it, the name of the model, and some features of the model.

Scientist & Name of Model	DALTON - Billiard Ball Model	THOMSON - Plum Pudding Model	RUTHERFORD - Planetary/Bohr System Model	BOHR - Energy level Model
Model Image				
Features	The atom is a solid, indivisible sphere	Negatively charged electrons are embedded in a positively charged fluid	Electrons orbit the positively charged nucleus	Electrons orbit the nucleus in fixed pathways called energy levels; the number of electrons that can fit in an energy level is limited.

6. What is a valence electron?

In a Bohr diagram, valence electrons are those in the outermost electron shell. They are important because they are the electrons that participate in chemical reactions.

7. Draw the Bohr diagram for each element. Then indicate the number of valence electrons each would have.

<p>a. Sodium</p> <p>Number of valence electrons = <u>1</u></p>	<p>c. Nitrogen</p> <p>Number of valence electrons = <u>5</u></p>
<p>b. Calcium</p> <p>Number of valence electrons = <u>2</u></p>	<p>d. Fluorine</p> <p>Number of valence electrons = <u>7</u></p>

8. Based on valence electrons, which 2 elements from the previous question would be the most reactive? Explain.

Sodium & Fluorine because they are closest to having full valence shells.

9. Which two elements are more alike in terms of reactivity & behavior: Lithium and Sodium or Lithium and Beryllium? Explain.

Li and Na because they are in the same chemical families & therefore share the same number of valence electrons.

10. An atom of magnesium has 12 protons, 12 electrons, and 13 neutrons. What is its mass number?

25

11. An atom of iron has 26 protons, 30 neutrons, and 26 electrons. What is its mass number?

56

12. What is an isotope? Give an example of two isotopes of an element, and indicate how many protons, electrons, and neutrons each has.

Isotopes are atoms of the same element that contain different numbers of neutrons. Examples:

different \Rightarrow

	Carbon-12	Carbon-14
p^+	6	6
n^0	$12 - 6 = 6$	$14 - 6 = 8$
e^-	6	6

13. Define and give an example of an ion -

An ion is an atom that has lost or gained electrons

Examples: Mg^{2+} has lost 2 electrons
 S^{2-} has gained 2 electrons

14. Compare and contrast "cations" and "anions" & give an example of each -

Cation = positively charged ion (Mg^{2+})

Anion = negatively charged ion (S^{2-})

15. Define and give an example of a "multivalent ion" -

A multivalent ion has more than one possible charge as shown on your periodic table.

Example: copper can be Cu^{2+} or Cu^+

16. Define and give an example of a "polyatomic ion" -

A group of atoms that act as an ion by having an overall charge. Examples: NH_4^+ , SO_4^{2-} , NO_3^- , PO_4^{3-}

17. Compare and contrast molecular and ionic compounds

	IONIC	MOLECULAR
Composition	cation plus anion	non-metals only
Electron distribution (shared vs transferred)	transferred	shared
Typically soluble in water?	yes	no
Solutions are electrolytes? (conduct electricity)	yes	no

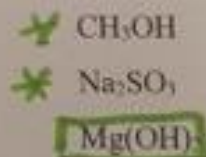
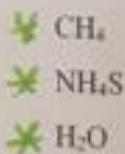
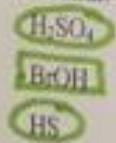
18. Name or write the chemical formula of each of the following

Ionic or Molecular?	Name	Chemical Formula
	Bromine monofluoride	BrF
M	potassium dichromate	$\text{K}_2\text{Cr}_2\text{O}_7$
I	iron (III) sulfide	Fe_2S_3
I	aluminum sulfate bromide	AlBr_3
I	phosphorus pentachloride	PCl_5
M	Zinc Hydroxide	Zn(OH)_2
I	Tin sulfate (IV) phosphate	SnSO_4 $\text{Sn}_3(\text{PO}_4)_2$
I	Nitrogen monoxide	NO
M	difluoride tetraoxide	F_2O_4
M		

19. Complete the following table comparing acids and bases.

	Definition	Properties	Examples
Acids			
Bases			

20. Circle the chemicals below that are acids. Draw a box around the bases. Draw a star next to the chemicals that are neutral.



21. An unknown solution is found to be a conductor of electricity, and turns litmus paper blue. Is the solution acidic, basic, or neutral?

Basic

22. Name each of the following acids.

a. H_2SO_4 sulfuric acid

b. HNO_3 nitric acid

c. HCl hydrochloric acid

d. H_2S hydrosulfuric acid

23. Name each of the following bases

a. $\text{Ca}(\text{OH})_2$ calcium hydroxide

b. NH_4OH ammonium hydroxide

c. $\text{Ti}(\text{OH})_3$ titanium(III) hydroxide

d. LiOH lithium hydroxide

24. Determine whether each of the following compounds are soluble or insoluble in water.

a. Na_2SO_4 - soluble (aq)

b. PbI_2 - insoluble (s)

c. AgNO_3 - soluble (aq)

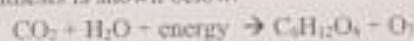
d. KClO_4 - soluble (aq)

25. Compare and contrast endothermic and exothermic chemical reactions.

Endothermic - reaction absorbs heat

Exothermic - reaction releases heat

26. The chemical reaction for photosynthesis is shown below.



Based on this chemical equation, state whether photosynthesis is endothermic & exothermic. Explain how you know.

Endothermic because the ~~products~~ ^{reactants} include thermal energy as a requirement for the reaction.

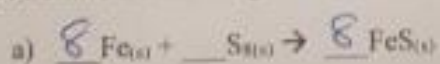
27. Explain the difference between physical & chemical change. Provide an example of each.

A physical change does not include the production of a new substance with distinct properties whereas a chemical change does.

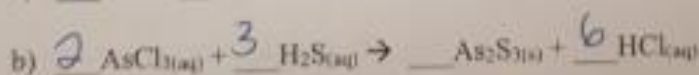
28. Is ice melting an example of a physical or chemical change? Explain.

NO, no new substance is produced

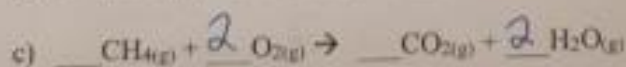
29. Balance the following chemical equations & identify the type of reaction



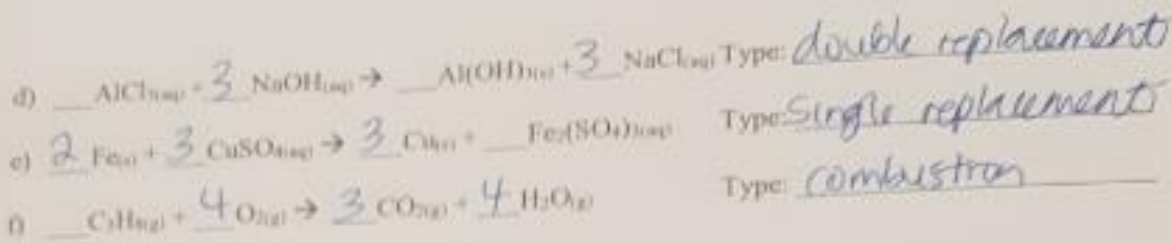
Type: composition/formation



Type: double replacement

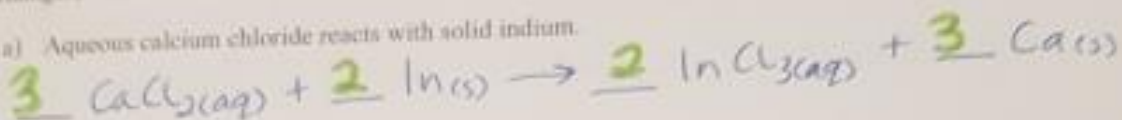


Type: combustion

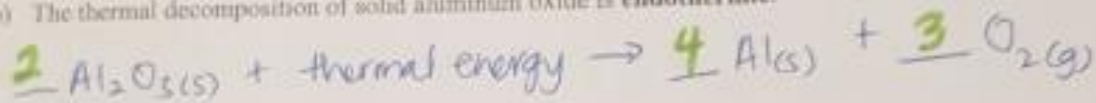


30. Write a **balanced** chemical equation for each of the following word equations. In cases that describe energy changes, write the term "thermal energy" on the correct side of the equation. Include **states of matter**.

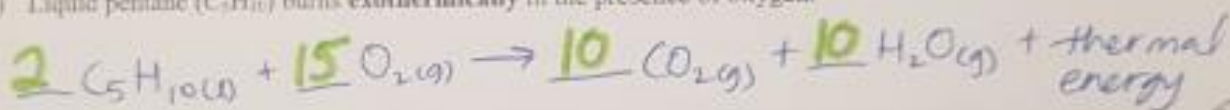
a) Aqueous calcium chloride reacts with solid indium.



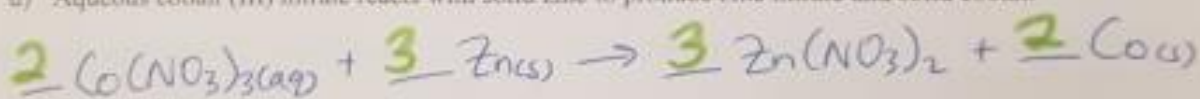
b) The thermal decomposition of solid aluminum oxide is **endothermic**.



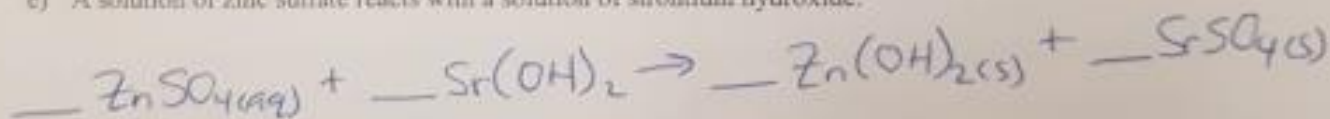
c) Liquid pentane (C_5H_{10}) burns **exothermically** in the presence of oxygen.



d) Aqueous cobalt (III) nitrate reacts with solid zinc to produce zinc nitrate and solid cobalt.



e) A solution of zinc sulfate reacts with a solution of strontium hydroxide.



31. Calculate the molar mass of

a. NaBr

102.89

c. $\text{Zr}_3(\text{PO}_4)_4$

653.54

b. CaF_2

78.08

d. iron (III) chloride

162.2

32. Calculate the number of moles in

$$n = \frac{m}{M}$$

a. 34 g of NH_4NO_3

$$n = \frac{34\text{g}}{80.06\frac{\text{g}}{\text{mol}}} = \boxed{0.4247\text{mol}}$$
$$= \boxed{0.42\text{mol}}$$

$$\text{N: } 14.01 \times 2 = 28.02$$

$$\text{H: } 4 \times 1.01 = 4.04$$

$$\text{O: } 3 \times 16 = 48$$
$$\underline{\hspace{1.5cm}}$$
$$80.06\text{g/mol}$$

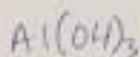
33. Calculate the mass of

a. 17 moles of water

$$m = nM = 17(18.02)$$
$$= 306.34$$
$$= \boxed{3.1 \times 10^2\text{g}}$$

b. 54 g of aluminum hydroxide

$$n = \frac{m}{M} = \frac{54\text{g}}{78.01} = 0.6922$$
$$= \boxed{0.69\text{mol}}$$



$$\text{Al: } 26.98 \times 1 = 26.98$$

$$\text{O: } 16 \times 3 = 48$$

$$\text{H: } 1.01 \times 3 = 3.03$$
$$\underline{\hspace{1.5cm}}$$
$$78.01$$

b. 29.98 moles of $\text{Ni}_2(\text{SiO}_3)_4$

$$m = nM = 29.98(345.65)$$
$$= 10362.587$$
$$= \boxed{1.034 \times 10^4\text{g}}$$

$$\text{Ni: } 58.69 \times 2 = 117.38$$

$$\text{Si: } 28.09 \times 3 = 84.27$$

$$\text{O: } 16 \times 8 = 128$$
$$\underline{\hspace{1.5cm}}$$
$$345.65$$

UNIT B: PHYSICS

1. Do the following conversions

a. 25 km = 25000 m

b. 3.5 m = 3500 km

c. 54 J = 54000 kJ

d. 3.25 cm = .0325 m

e. 1 hr = 3600 s

f. 12 kg = 12000 g

2. Put the following in scientific notation to 3 significant figures.

a. 2300 J $2.30 \times 10^3\text{J}$

b. 0.00789 N $7.89 \times 10^{-3}\text{N}$

c. 4530062 kg $4.54 \times 10^6\text{kg}$

d. 0.0000267 m $2.67 \times 10^{-5}\text{m}$

e. 3000 J $3.00 \times 10^4\text{J}$

f. 0.00891 g $8.91 \times 10^{-3}\text{g}$

3. Complete the following table comparing scalar & vector quantities.

Quantity	Definition	Examples
Scalar	A quantity that includes magnitude but NOT direction	time, speed, distance
Vector	A quantity that includes both magnitude AND direction	velocity, acceleration, displacement

4. Define the terms "uniform motion" & give an example

An object is travelling at uniform motion if it maintains a constant speed in a straight line. Example: a car travelling on cruise control on a straight road.

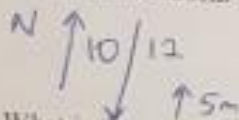
5. A student runs a distance of 10 m North over a period of 12 s. They then run 12 m South over a period of 15 s, and another 5 meters North over a period of 8 s.

a) What is the total distance travelled by the student?

$$d = 10\text{m} + 12\text{m} + 5\text{m} = 27\text{m}$$

b) What is the student's displacement from their original position?

$$\vec{d} = 3\text{m}[\text{N}]$$



c) What is the student's average speed?

$$v_{\text{avg}} = \frac{27\text{m}}{(12\text{s} + 15\text{s} + 8\text{s})} = 0.77 = \boxed{0.8\text{ m/s}}$$

d) What is the student's average velocity?

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t} = \frac{3\text{m}[\text{N}]}{(12\text{s} + 15\text{s} + 8\text{s})} = 0.0857 \text{ m/s}[\text{N}]$$

$$\boxed{= 0.09\text{ m/s}[\text{N}]}$$

6. A skateboarder travels with uniform motion as she approaches a ramp at 33 km/h. How fast is she travelling in m/s?

$$33 \frac{\text{km}}{\text{h}} \times \frac{1000\text{m}}{1\text{km}} \times \frac{1\text{h}}{3600\text{s}} = 9.1666 = \boxed{9.2\text{ m/s}}$$

7. An object moves at a constant speed of 2.8 m/s for a period of 5 minutes. How far does it travel, in meters?

$$8 \times 10^2 \text{ m}$$

8. A car accelerates from a speed of 60 km/h to a speed of 110 km/h over a period of 20s.

a. Is the car's acceleration positive or negative? Explain.

Positive because he is speeding up and travelling in the positive direction

b. Determine the car's rate of acceleration, in m/s². *(should say m/s²)*

$$\vec{a} = 0.069444... \text{ m/s}^2$$

$$= 7 \times 10^{-2} \text{ m/s}^2$$

9. An object travels at an initial velocity of 2.3 m/s [W]. If the object's average acceleration is 0.50 m/s² [W], how long will it take the object to reach a velocity of 9.6 m/s [W]?

$$t = 14.6 \text{ s} = 15 \text{ s}$$

10. The 4 graphs shown to the right represent the motion of a bug travelling around. Identify the graph matching each description below.

a. the bug is decreasing his rate of acceleration

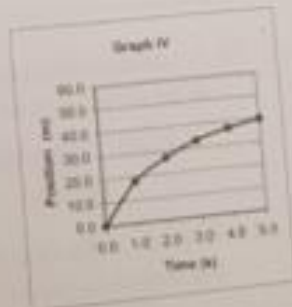
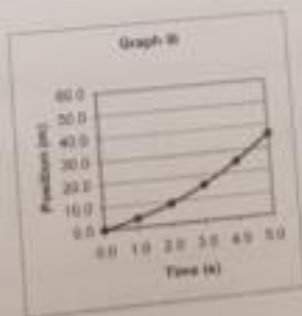
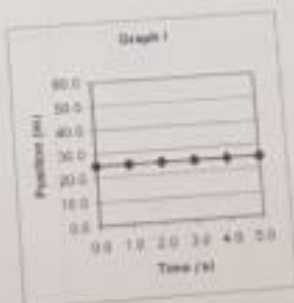
b. the bug is travelling with constant velocity

c. the bug is not moving

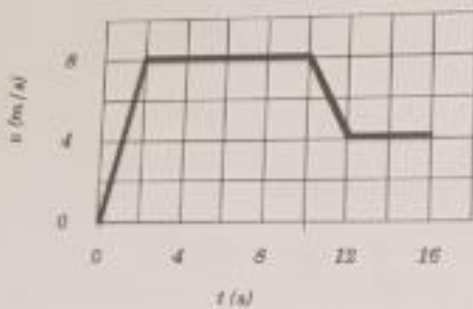
d. the bug is accelerating

e. Calculate the average velocity of the object in Graph B.

$$10 \text{ m/s}$$



11. Consider the following graph depicting the motion of a bird over time:



a) How far does the bird travel in the first 2 seconds?

8m

b) Calculate the bird's rate of acceleration from 10 and 12 s.

-2m/s^2

c) Calculate the displacement of the bird over the first 10 s.

72m

12. Complete the following table comparing measurements of force, work, and energy.

Measurement	Definition	Formula(s)	Unit(s) of measurement
Force	A push or pull	$F=ma$ $W=Fd$	Newtons (N)
Work	The energy taken to apply a force across a distance	$W=Fd$	Joules (J)
Energy	The capacity to do work	$E_k = \frac{1}{2}mv^2$ $E_p = mgh$ $E_m = E_k + E_p$	Joules (J)

13. A person pushes hard against a wall, exerting lots of energy and becoming sweaty in the process. Is the person doing work? Explain.

No, because the wall does not move in the direction of the push.

14. The kids in the class pile their textbooks into the arms of one student. The student walks forward a distance of 3 m before the books topple over. Did the student do work? Explain.

No, the pile of books does not move in the same direction as the application of force.

15. A hockey puck with a mass of 8.50 g is struck by a hockey stick, causing it to accelerate at a rate of 7.5 m/s^2 . Determine the force applied to the puck by the stick.

$$F = 0.06375 \text{ N}$$
$$= 0.064 \text{ N or } 6.4 \times 10^{-2} \text{ N}$$

16. A force of 102 N is applied to an object, causing it to accelerate. If the object reaches a velocity of 5.50 m/s after a period of 10.0 s, what must be the mass of the object?

$$m = 185.4545 \dots$$
$$= 185 \text{ kg or } 1.85 \times 10^2 \text{ kg}$$

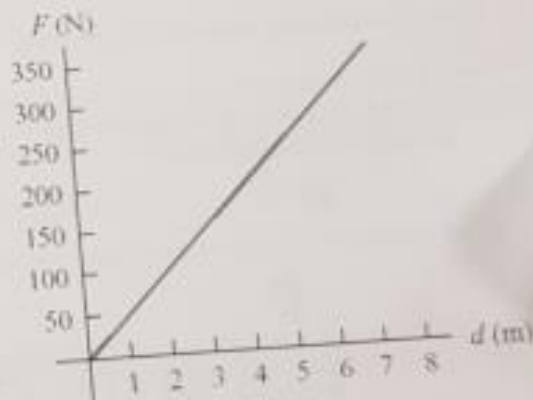
17. Consider the following graph used to represent the amount of force required to move a 25.0 kg desk a distance of 8 m:

- a) Determine the amount of work done on the desk in order to slide it a distance of 8 m.

$$400 \text{ J}$$

- b) Determine the desk's acceleration after being pushed a distance of 5 m.

$$10 \text{ m/s}^2$$



18. The kinetic energy of a vehicle is 25,671 kJ. If the vehicle has a mass of 1500.0 kg, at what speed is the vehicle travelling?

$$185.01 \text{ m/s}$$

19. A ball has a potential energy of 981 J at a height of 10 m where it is at rest.

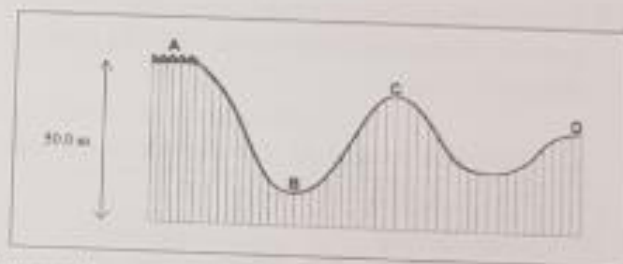
a. What is the kinetic energy of the ball just as it falls and strikes the ground?

$$981 \text{ J}$$

b. Calculate the mass of the ball

$$10 \text{ kg}$$

20. Consider the following diagram of a roller coaster car...



a) At which point does the car have the most gravitational potential energy?

A

b) At which point does the car have the most kinetic energy?

B

c) The roller coaster car has a mass of 125 kg. Calculate the gravitational potential energy of the car at Point A.

$$E_p = 61312.5 \text{ J}$$
$$= 6.13 \times 10^4 \text{ J}$$

d) How high is the car at Point C if it has 52000.0 J of gravitational potential energy?

$$h = 42.405708...$$
$$= 42.4 \text{ m}$$

e) The coaster car has 12500.0 J of kinetic energy at Point B. How fast is it moving?

$$v = 14.1421356...$$
$$= 14.1 \text{ m/s}$$

21. For each type of potential energy, give an example of an object/situation that contains it:
- elastic potential energy - slingshot, stretched hair tie, spring
 - chemical potential energy - food, batteries, coal/oil/natural gas, wood
 - gravitational potential energy - wrecking ball, roller coaster at the top of the hill
22. What is mechanical energy?
The total kinetic plus potential energy of a system.
23. What is efficiency?
A measure of how much work or energy is conserved during a conversion from one form of energy to another.
24. A In lifting a car, the total mechanical energy input of a hydraulic hoist is 5610 Joules, while the useful mechanical energy output is 1926 Joules. Calculate the percent efficiency of the hoist.

34.3%

25. Describe the energy conversions required to produce electrical energy from the burning of coal in a power-plant.
- coal → is burned → turbine → electricity is produced
(chemical) (thermal) (mechanical) (electrical)

UNIT C: BIOLOGY

1. List the three main points of cell theory.
- All living things are composed of cells
 - The cell is the smallest functional unit of life
 - All cells come from pre-existing cells through the process of cell division.
2. Match each scientist listed below with their contribution to microscopy & cell theory.

<u>Scientist</u>	<u>Contribution</u>
A. Hooke	<u>C</u> Invented the first microscope
B. Leeuwenhoek	<u>A</u> Coined the term "cell" after viewing cork under a microscope
C. Janssens	<u>E</u> Disproved the theory of spontaneous generation
D. Schleiden	<u>D</u> Concluded that plants were composed of cells
E. Pasteur	<u>B</u> First to see living cells under a microscope

3. Identify the controlled, manipulated, and responding variables in Pasteur's experiment.

Controlled (list 3)	Manipulated	Responding
Type, amount of broth Temp of broth Time to sit	Flask configuration (with or without Swan neck)	microorganism growth.

4. The following is an image of a protist under a microscope at 100X magnification (medium power). The field diameter is 1500 μm .

- a) What is the estimated size of the protist? (record your answer in μm)

approx. 500 μm

- b) What is the scale of their drawing?

a approx. 50x



5. What makes a microscope "compound"?

objects are viewed through 2 or more lenses at the same time.

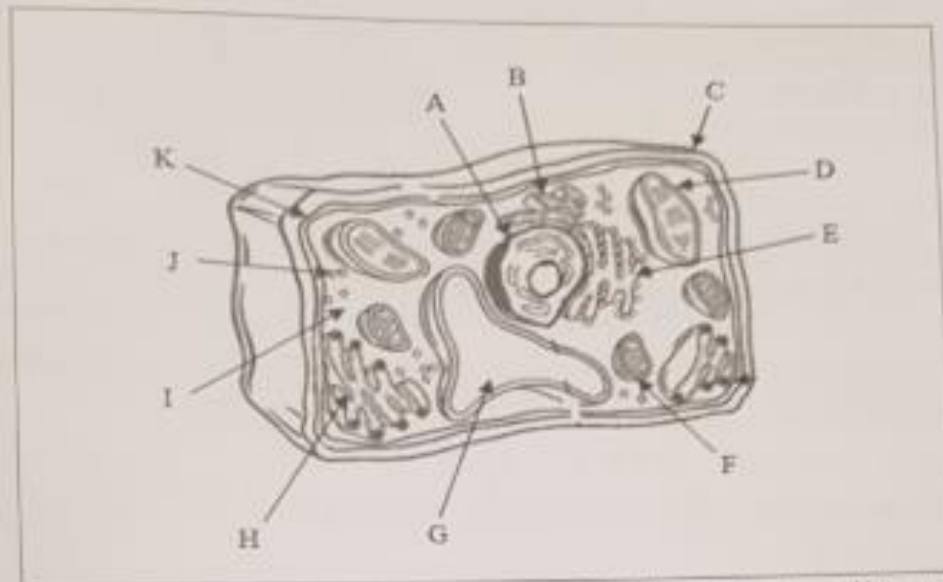
6. If a compound microscope has a 10x ocular lens and a 25x objective lens, what is the total magnification?

250x

7. Match the organelles in column A with the correct function in column B.

a cytoplasm	a) jelly like fluid containing cellular organelles
g nucleus	b) ribosomes are made here; network of tubules for transporting substances
h chloroplast	c) makes ATP energy through the process of cellular respiration
b nucleolus ER	d) digests worn out cell parts & destroys invaders (bacteria, viruses, etc.)
j Golgi apparatus	e) site of protein synthesis (production)
c mitochondria	f) storage area
k centrioles	g) the "brain" of the cell; contains DNA
i cell wall	h) produces glucose through the process of photosynthesis; in plant cells only
e ribosomes	i) protective, sturdy layer surrounding plant cells
f vacuole	j) the packaging and distribution center
d lysosomes	k) only in animal cells; helps with cell division

8. Consider the following diagram of a plant cell...



a) Identify the letter(s) of the organelle(s) that meet each of the following descriptions. You may use the same letter more than once.

- C, D Only found in plant cells
- D Used to produce glucose
- F Used to produce ATP
- C Provides support & structure to the cell
- D Contains chlorophyll pigments which absorb sunlight for photosynthesis
- G Stores water

9. Explain the main difference between active and passive transport in terms of energy and concentration gradients.

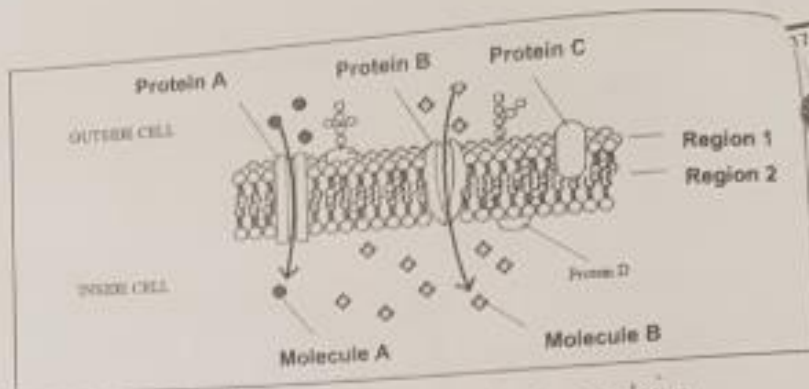
Active - Requires ATP energy to move substances against the concentration gradient (low to high)

Passive - Does not require energy to move substances down the concentration gradient (high to low)

10. Differentiate between each of the following cell transport processes:

- both are forms of active transport
- Endocytosis - Moves large particles or particles in bulk into the cell
 - Exocytosis - Moves large or bulk particles out of the cell

11. Consider the following diagram of a cell membrane:



- a) Which region repels water?
What is the term that describes this region?

Region 2 -
Phospholipid.

- b) Which process is used to transport Molecule A into the cell? How do you know?

Facilitated diffusion because there is a carrier protein transporting substances down the concentration gradient.

- c) Which process is used to transport Molecule B into the cell? How do you know?

Protein-mediated active transport because a carrier protein is transporting the molecule against its concentration gradient.

12. Why is it beneficial for cells to have a greater surface area to volume ratio?

They can be more efficient at transporting substances across the cell membrane (acquiring nutrients & excreting waste)

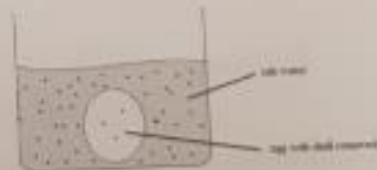
13. How could you increase the surface area to volume ratio of an object?

Make it smaller.

14. What are some advantages and disadvantages of multicellularity?

Advantages - Cells become more efficient as they specialize; multicellularity affords size; one cell's death does not mean the death of the organism.
Disadvantages - Takes time & effort to reproduce & raise young

15. An egg's shell is removed and it is placed in a solution of salt water. The membrane of an egg is permeable to water, but not to salt...



- a) Is the egg considered to be hypertonic or hypotonic relative to the solution of salt water around it?

Hypotonic

- b) What can we expect to observe if the egg is left in the solution of salt water overnight? Explain.

Water will leave the egg cell by osmosis in an effort to equalize the concentrations inside vs outside the cell.

16. Complete the following table comparing the three main plant tissues.

Tissue	Location	Roles	Specializations
Dermal	Top & bottom layer of the leaf	protect plant	Cuticle, stomata, guard cells
Ground	between dermal layers	gas exchange & photosynthesis	palisade mesophyll & spongy mesophyll
Vascular	tubes between dermal layers	water & nutrient transport	xylem & phloem

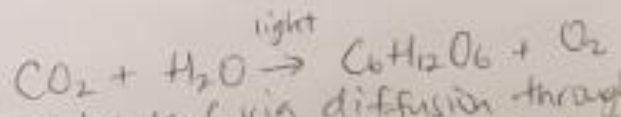
17. Complete the table comparing the two types of vascular tissue.

Tissue	What it transports	Direction of transport
Xylem	water	up from roots to stems & leaves
Phloem	nutrients & sugar	sugar made in the leaves is transported to growing parts of the plant.

18. Outline the 4 ways water is transported upwards against gravity in plants

- Root pressure
- Transpiration
- cohesion
- adhesion

19. Describe the purpose & process of photosynthesis

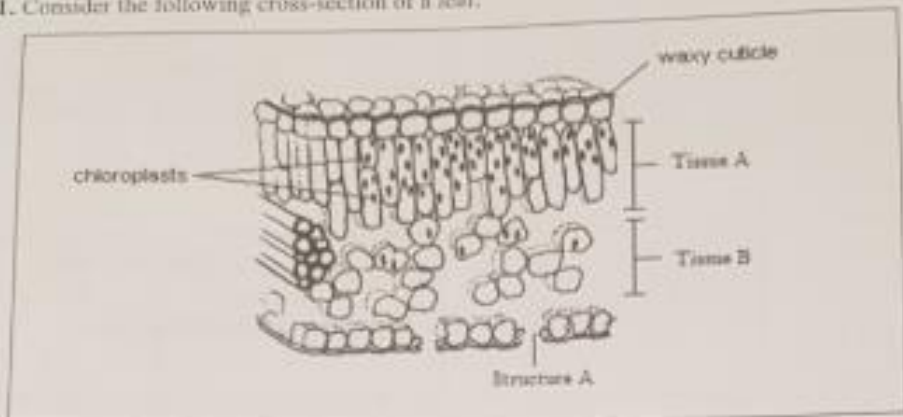


Water enters roots by osmosis, CO₂ enters leaf via diffusion through stomata into spongy mesophyll. Sugar is produced in the palisade layer & oxygen is released as a byproduct. The purpose of photosynthesis is to produce food for the plant.

20. Describe the purpose & process of transpiration in plants

Water enters the roots by osmosis & is pushed up the stem by root pressure. Transpiration pulls water ^{through xylem} to the leaves & out through the stomata where it evaporates into the atmosphere. The purpose of transpiration in plants is to regulate water transport.

21. Consider the following cross-section of a leaf:



a) Identify each of the following:

Tissue A - Palisade mesophyll

Tissue B - Spongy mesophyll

Structure A - Stoma (stomata is plural)

b) Explain why the cells in Tissue A appear to have more chloroplasts than the cells in Tissue B.

Palisade cells are involved in photosynthesis & chloroplast are the site of photosynthesis. They are concentrated near the upper epidermis to gather as much sunlight as possible.

c) Explain why the cells of Tissue B seem to be spread out

Spongy mesophyll cells are spread out to make space for gases, like CO_2 , to diffuse in & out of the leaf as needed.

d) What is the purpose of Structure A?

It is an opening to allow gases in and out of the leaf.

e) Identify 2 reasons Structure A might be closed.

① When turgor pressure is low the stomata are closed to conserve water.

② Stomata are closed at night for most plants.

22. Explain the difference between positive & negative tropism. Provide an example of each.

Positive tropism - movement towards a stimulus

Negative tropism - movement away from a stimulus.

23. What are meristems?

Areas of rapid cell division & growth on a plant.

24. What are auxins? What purpose do they serve in plants?

Auxins are hormones that mediate positive phototropism in plants. Auxins concentrate on the side of a plant that is shaded, causing shaded cells to elongate so the plant stem/leaf bends towards the light.