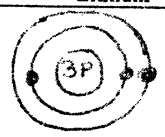
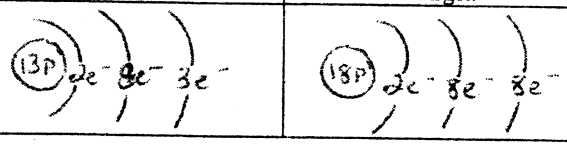
June Review Term 1

Topic 1- Atomic Model and Periodic Table

1. Make a Bohr-Rutherford model for the following:

Lithium	Aluminum	Argon
		

2. Define or explain the following words:

Family or group column of p.table, all elements have similar chem. prop. (because same # valence e⁻)

Periods or energy levels row of p.table, all elements have same # orbitals (energy levels)

Metals elements to left of staircase
- conduct elec + heat, ductile, malleable, shiny, react with acids

Non-metals elements right of staircase
- none of characteristics of metals above

Metalloids elements along staircase, characteristics of both metals + nonmetals

Valence electrons electrons on last orbital

3. Give three characteristics of each family.

Alkali metal	Alkaline earth metal	Halogen	Noble or inert gas
• soft • light • melt at low temp • never found as free elements • excellent conductors • react violently with water	• excellent conductors • harder than alkali metals • similar reactions than alkali but less violent • melting pt higher than alkali	• S, L, G at room temp. • coloured • very reactive • form salts with alkali metals • form acids with hydrogen • toxic, corrosive, bactericidal	• colourless in natural state • almost completely non-reactive • used in illuminated signs

4. What are the Lewis diagrams for the following elements:

Sodium- Na	Phosphorus- P	Calcium- Ca	Aluminum- Al	Sulfur- S
Na •	• P:	• Ca •	• Al •	:S•

5. Which element is being described?

I am in period 2 and have 2 valence electrons.	Be
I have 2 energy shells and each is full	Ne
A halogen whose electrons are distributed among 3 energy levels	Cl
An alkali metal that has 2 energy levels	Li
I form a $^{+1}$ ion and have 3 orbitals	Na
I form a $^{-3}$ ion and have 2 periods	B
I am the most reactive alkali metal	Fr

Topic 2- Solutions and Electrolytes

1. What is a solution?

mixture solute + solvent, homogeneous

2. What is the formula used for calculating the concentration of a solution?

$c = \frac{m}{V}$

3. What does a solution with a concentration in 'ppm' mean?

ppm = parts per million $\frac{1g \text{ solute}}{1000000 \text{ ml solution}}$.

4. The water in a lake is contaminated. To determine the concentration of the contaminant, a technician takes a 100 mL sample of water. After several tests, he concludes the sample contains 4.25 mg of contaminant. Calculate the concentration of the contaminant in ppm.

① $\frac{4.25 \text{ mg}}{100 \text{ ml}} \rightarrow \frac{0.00425 \text{ g}}{100 \text{ ml}}$.

② $\frac{0.00425 \text{ g}}{100 \text{ ml}} : \frac{x \text{ g}}{1000000 \text{ ml}} \Rightarrow 42.5 \text{ ppm}$

5. If you convert a 15 g/L to a % concentration and a ppm, explain which one will be more concentrated. Determine which one will have the most solute?

→ $\frac{15g}{L} = \frac{1.5g}{100ml}$ (1.5%) = 15000 ppm > concentrations are the same (equivalent)

→ ppm = most solute

6. Convert the following units to ppm:

A) 10 % B) 15 g/L C) 2 g/300 mL D) 0.5 mg/L → 0.0005

$\frac{10}{100} : \frac{x}{1000000}$ 100 000 ppm

$\frac{15g}{1000ml} : \frac{x}{1000000}$ 15000 ppm

$\frac{2g}{300ml} : \frac{xg}{1000000ml}$ 6666.7 ppm

$\frac{0.0005g}{1000ml} : \frac{x}{1000}$ 0.5 ppm

7. Convert the following units to g/L:

A) 5 % B) 3 g/200 mL C) 100 g/ 2 L D) .03 mg/L → 0.00003g

$\frac{5g}{100ml} : \frac{xg}{1000ml}$ 50g/L

$\frac{3g}{200ml} : \frac{xg}{1000ml}$ 15g/L

$\frac{100g}{2L} : \frac{xg}{1L}$ 50g/L

$\frac{0.00003g}{1L}$ 3×10^{-5} g/L

8. Convert the following units to %:

A) 30 g/L B) 5 g/20 mL C) 50 ppm D) 2.5 mg/L → 0.0025g

$\frac{30g}{1000ml} : \frac{xg}{100ml}$ 3%

$\frac{5g}{20ml} : \frac{xg}{100ml}$ 25%

$\frac{50g}{1000000ml} : \frac{xg}{100ml}$ 0.005%

$\frac{0.0025g}{1000ml} : \frac{xg}{100ml}$ 0.00025%

9. In a pond, the lethal concentration of nitrate (NO_3^-) is **0.08 g/L** and phosphate's (PO_4^{3-}) lethal concentration is **0.6 mg/L**. This means if the concentration of nitrate or phosphate is over the values given, certain types of aquatic organisms will die. You test the water and get the following values:
Nitrate has a concentration of 45 ppm. Phosphate has a concentration of 0.15 ppm. Determine if the pond contains any lethal doses of these contaminants.

LETHAL: NO_3^- = 0.08 g/L

PO_4^{-3} = 0.6 mg/L → 0.0006 g/L

Tested Water:

(1) NO_3^- = 45 ppm $\frac{45g}{1000000ml} : \frac{xg}{1000ml}$ → 0.045 g/L

0.045 g/L < 0.08 g/L ∴ NOT LETHAL

real value lethal value

PO_4^{-3} = 0.15 ppm $\frac{0.15g}{1000000ml} : \frac{xg}{1000ml}$ → 0.00015 g/L

lethal

10. You need to make 250 ml of a 15 g/L solution. List the steps you would take and show the calculations to support your method.

① Calculate amount of solute needed.

$\frac{15g}{1000ml} : \frac{x\,g}{250ml} \rightarrow 3.75g$

② Mass 3.75g solute
③ Put solute into 250ml volumetric flask
④ Fill flask half-way with water
⑤ Swirl until solute dissolved.
⑥ add water up to 250ml mark
⑦ mix

11. Explain what an electrolyte and a non-electrolyte are.

conducts electricity when dissolved in water

does not allow an electric current to flow through it when dissolved in water

12. Why are acids, bases and salts electrolytes?

– dissociate into ions when dissolved in water

13. What test determines if a substance is an electrolyte or a non-electrolyte?

– conductivity meter

14. How can you identify an acid, base and salt by looking at their molecular formulas?

acid → starts with 'H' (non-metal at end)
base → ends in 'OH' (NH4 or metal at front)
salt → made up of metal + non-metal

15. How can you is identify a non-electrolyte from its molecular formula?

made up of covalent bonds (2 non-metals)

16. Which of the following, when dissolved in water, must be an electrolyte?
A) CO_2 B) HNO_3 C) H_2O D) $C_6H_{12}O_6$

17. Which of the following, when dissolved in water, will be a non-electrolyte?
A) KCl B) HCl C) KOH D) C_2H_5OH

18. Which of the following substances would you use to clean greasy dishes?
A) KCl B) HCl C) KOH D) C_2H_5OH

19. Which of the following is a salt?
A) KBr B) LiOH C) HNO_3 D) SO_2

20. You want to neutralize something with a pH of 4, what would you use?
A) water B) an acid C) something with a pH of 7 D) $Mg(OH)_2$

21. Write the equation for the electrolytic dissociation of the following compounds:

$CaCl_2$ $CaCl_{2(s)} \xrightarrow{H_2O} Ca^{+2}_{(aq)} + 2Cl^{-1}_{(aq)}$

HCl $HCl_{(g)} \xrightarrow{H_2O} H^+_{(aq)} + Cl^-_{(aq)}$

22. Fill in the table. Give the pH range or number(< 7, >7, 7).

	$Ca(OH)_2$	$CaCl_2$	CH_3COOH	CH_3OH	H_2SO_4	HCl	NCl_3	NaCl
Acid, base, salt or neither	B	S	neither	neither	A	A	neither	S
pH range or #	>7	7	7	7	<7	<7	7	7
Electrolyte or Non-elect.	elec.	elec	non-elec	non-e	elec	elec	non-e	elec

23. What is the pH range of acids, bases and salts?

<7 >7 7

24. Explain how indicators and buffer solutions are used to identify an unknown solution.

① buffer solutions → known pH level
put 1 drop of indicator in each buffer solution (5 drops)
(pH 1 - 12)
② observe colour of indicator at each pH level
③ put 1 drop of indicator in unknown solution (5 drops)
④ match colour of unknown to one of buffer solutions (has same pH as buffer solution)

25. Use the table below to answer questions a to e.

pH	1	2	3	4	5	6	7	8	9	10	11	12	13
A	Red			Orange				Yellow					
B	Blue		Green		Yellow								
C	Red				Purple				Blue				

a- Which indicator would you use for a strong acid? B
b- What colour will indicator A turn with a pH of 5? orange
c- If indicator A turns orange and indicator B turns green, what is the pH of the substance? 4
d- What is the ph range of indicator C turns purple? 5-8
e- If a substance has a pH of 3 with indicator B, which colour will develop? green

26. How many times more acidic is a solution of pH 2 than a solution of pH 6?

2 3 4 5 6 (×10 ×10 ×10 ×10) — 10 000 × more acidic

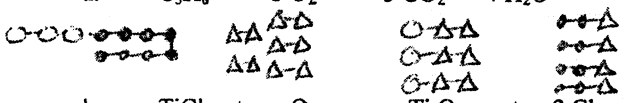
27. How many times more basic is a solution of pH 11 than a solution of pH 8?

8 9 10 11 (10 10 10) — 1000 × more basic

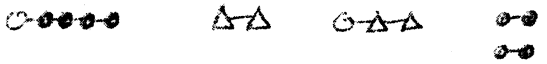
Topic 3- Balancing Equations, Neutralization and Combustion

1. Give the signs that show a chemical change occurred.
   - change in colour
   - production of heat / becomes cold
   - production of light
   - formation of a precipitate
   - change in mass
2. Represent each equation using the particle model.

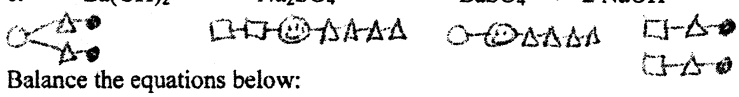
   a. $C_3H_8 + 5\,O_2 \rightarrow 3\,CO_2 + 4\,H_2O$

   b. $TiCl_4 + O_2 \rightarrow Ti\,O_2 + 2\,Cl_2$

   c. $Ba(OH)_2 + Na_2SO_4 \rightarrow BaSO_4 + 2\,NaOH$

3. Balance the equations below:

   $C_6H_{12}O_6 + 6\,O_2 \rightarrow 6\,CO_2 + 6\,H_2O$

   $Pb(NO_3)_2 + 2\,KI \rightarrow PbI_2 + 2\,KNO_3$

   $Cl_2 + 2\,Na \rightarrow 2\,NaCl$

   $4\,NaOH \rightarrow 4\,Na + O_2 + 2\,H_2O$

   $2\,NH_3 + 3\,Cl_2 \rightarrow 6\,HCl + N_2$

   $4\,Al + 3\,O_2 \rightarrow 2\,Al_2O_3$

4. When 191 g of copper, Cu, is combined with 756 g of nitric acid, HNO_3, the chemical reaction produces 563 g of copper nitrate, $Cu(NO_3)_2$, 108 g of water, H_2O, and a certain amount of nitrogen dioxide, NO_2. This reaction is represented by the following balanced chemical equation: What mass of nitrogen dioxide does this reaction produce?

$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$$

191g + 756g → 947g

563g + 108g → 671g

xg

947 − 563 − 108 = 276

276g

5. The neutralization of 24.5 g of sulphuric acid (H2SO4) requires 42 g of sodium bicarbonate ($NaHCO_3$). This neutralization reaction produces 35.5 g of sodium sulphate (Na_2SO_4), 22 g of carbon dioxide (CO_2) and a certain amount of water (H_2O).
The balanced equation for this reaction is:
What is the mass of the water produced during this neutralization reaction?

$$H_2SO_4 + 2NaHCO_3 \rightarrow Na_2SO_4 + 2CO_2 + 2H_2O$$

24.5g + 42g → 66.5g

35.5g + 22g → 57.5g

xg

66.5 − 57.5 = 9g

9g

6. Explain how an indicator is used to determine when an acid or a base is neutralized?

① Put 1 drop indicator into solution to be neutralized.
→ if colour in acid range add base to solution
→ " " " basic " " acid " "
② Add acid 1 drop at a time until solution changes colour (swirl after every drop) * until colour of a neutral solution

7. What 2 products are produced when acids and bases neutralize themselves?

acid + base ⟶ salt + water

8. Write a chemical equation to show a neutralization reaction.

$$HCl + KOH \longrightarrow KCl + H_2O$$

9. You have been given a sample of water taken from a swimming pool. You are to determine whether this water is acidic, basic or neutral. The materials available are
   - a graduated cylinder containing 15 mL of vinegar (pH = 2.8)
   - a graduated cylinder containing 15 mL of ammonia (pH = 11)
   - a graduated cylinder containing 15 mL of pure water (pH = 7)
   - a small bottle of bromothymol blue without a colour chart

   Write the experimental procedure you would follow to determine whether the water is acidic, basic or neutral, using the materials available.

1- put 1 drop of indicator (bibluе) in each 15 ml of vinegar, ammonia + pure water
2- record colour of each solution
3- put 1 drop of bromothymol blue in 15 ml of pool water
4- match colour of pool water to the original solution and indicator
5- if pool water in same colour range as vinegar = acidic
6- " " " " " " " " ammonia = basic
7- " " " " " " " " water = neutral

10. Explain what oxidation and combustion are.

oxidation – chemical change involving oxygen or a substance with similar properties as oxygen

combustion – form of oxidation that releases a large amount of heat

ex burning and rusting cellular resp

11. Define what the fuel, oxidizing agent and ignition temperature are during the process of combustion.

oxidizing agent (causes a fuel to react) ex. O_2

fuel (substance that releases a large amount of energy by reacting with oxid. agent) ex. wood

ignition temperature (min. temp at which energy present can start combustion)

12. Name the three types of combustion. Describe each.

① rapid combustion → energy released quickly (heat/light) MCH
② spontaneous combustion → rapid combustion ignition temp reached without outside source
③ slow combustion → energy released slowly over time (ex. decomposition)

13. Write the chemical formulas associated with respiration and photosynthesis.

respiration: $C_6H_{12}O_6 + O_2 \rightarrow H_2O + CO_2 + E$

photosynthesis: $E + H_2O + CO_2 \rightarrow C_6H_{12}O_6 + O_2$

June Review Term 2

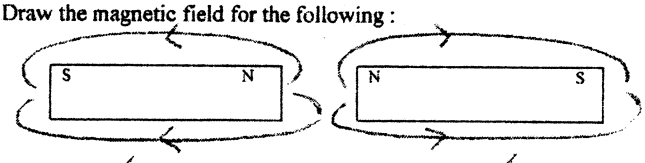
Topic 1- Magnetism and Static Electricity

1. What criteria must a substance have in order to be a magnetic substance?

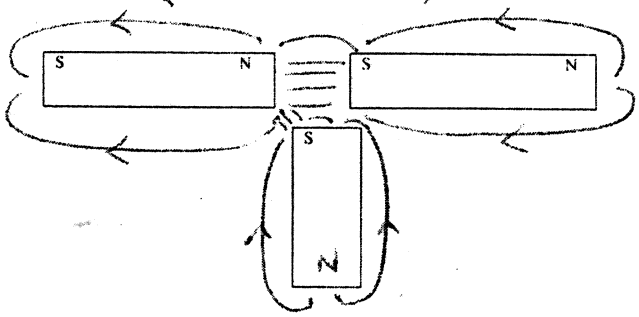
   – can attract Fe, Ni, Co

2. Draw the magnetic field for the following :

a.



b.



3. Explain how a compass works.

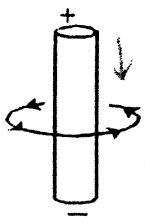
   – compass needle follows Earth's magnetic field
   – needle points North (geographic) = magnetic South

4. What is the right hand rule for a straight wire?

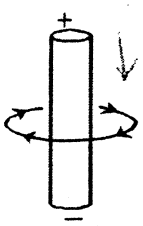
   – thumb points in direction of current flow
   – fingers wrap in direction of magnetic field

5. An electric current flows through a straight wire and produces a magnetic field. Which of the following diagrams correctly represents this magnetic field?

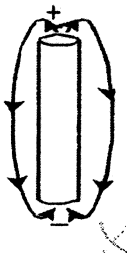
A)



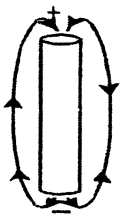
B)



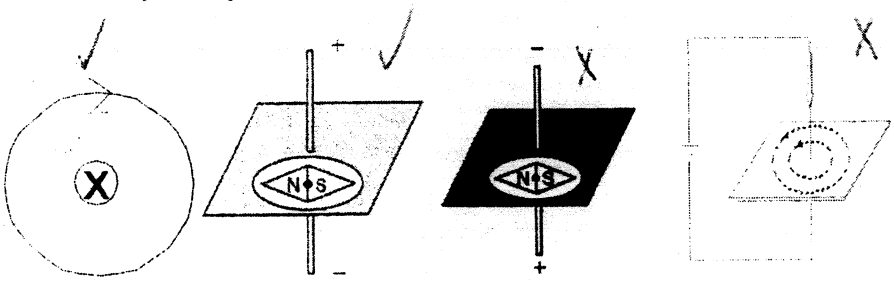
C)



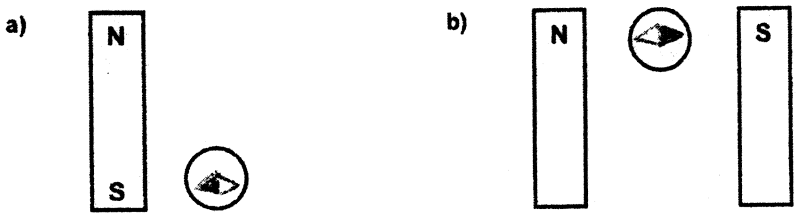
D)



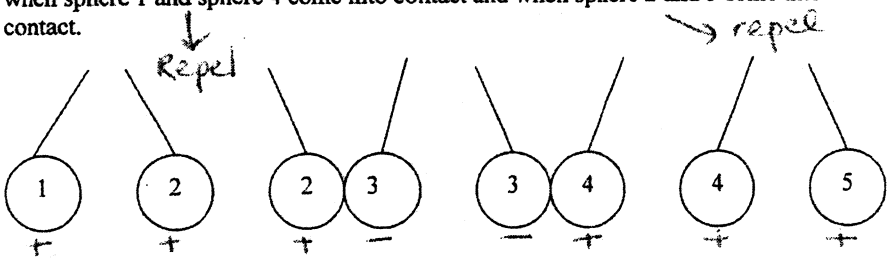
6. Which diagram(s) correctly show the relationship between the magnetic field and the electric current producing it?



7. Draw the position of the needle in each of the compasses placed near the magnets or wire illustrated below.



8. You have five spheres which are each electrically charged. Determine what will occur when sphere 1 and sphere 4 come into contact and when sphere 2 and 5 come into contact.



9. If two substances like cotton and acetate are rubbed together then separated, what reaction will occur when they are brought next to each other? Explain why this occurs?

cotton (−) } acetate (+) → take on opp. charges (electrons move onto cotton)

− will attract since have opposite charges

10. In the laboratory, a student was given the following substances :

1. ebonite
2. cotton
3. silk
4. glass

The student was told that when two substances from the above list are rubbed together, the one higher up in the list becomes negatively charged and the other becomes positively charged.

The student did the following :

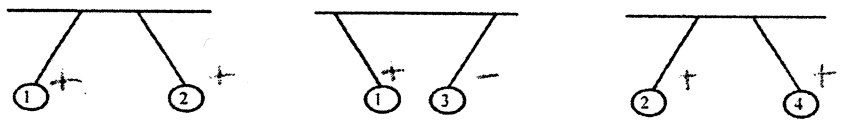
- Rubbed the ebonite and the silk together.
- Rubbed the glass and the cotton together.
- Brought the cotton close to the ebonite. → repel
- Brought the cotton close to the silk. → attract

Which one of the following statements is TRUE?

A) Ebonite and cotton repel each other; silk and cotton repel each other.
B) Ebonite and cotton repel each other; silk and cotton attract each other.
C) Ebonite and cotton attract each other; silk and cotton repel each other.
D) Ebonite and cotton attract each other; silk and cotton attract each other.

11. A student was given four electrically charged spheres.

The following diagrams show what happened when these spheres were suspended in pairs close to each other.



Which of the following statements is true?

A) Spheres 1, 2, 3 and 4 have the same charge.
B) Spheres 2, 3 and 4 have the same charge.
C) Spheres 1, 2 and 4 have the same charge.
D) Spheres 1 and 3 have the same charge.

Topic 2- Electricity Formulas and Circuits

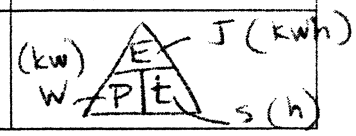
1. Define current intensity, resistance and potential difference. What are their symbols and units?

① current intensity – rate of flow of electrons (# charges going by every second)
I
A (amps)

② resistance – ability of a material to hinder flow of electrons, R, Ω

③ Potential difference – amount of energy a group of electrons has
V

2. In the table below fill in the formula in the top box, then give the appropriate triangle used for each unknown. Include units for each.

Resistance	Power	Energy
$R = \frac{V}{I}$	$P = I \cdot V$	$E = P \times t$
		

3. How would you convert the following time units:

Minutes to seconds $\times 60$
Hours to seconds $\times 60 \times 60$
Minutes to hours $\div 60$
W to kW $\div 1000$

Seconds to minutes $\div 60$
Seconds to hours $\div 60 \div 60$
Hours to minutes $\times 60$
J to kWh $\div 1000 \div 60 \div 60$

4. How much power did an electric lawn mower use if it used 45 000 J of energy in the 50 minutes it took to mow the lawn?

P = ?
E = 45000 J
t = 50 m × 60 = 3000 s

$P = \frac{E}{t}$

$P = \frac{45\,000\ J}{3000\ s}$

$\boxed{15\ W}$

5. How much time was a filter in a fish tank on when it needed 0.5 A, 100 V and 45 000 J of energy?

t = ?
E = 45 000 J
I = 0.5 A
V = 100 V

$P = I \times V$
$P = 0.5\ A \times 100\ V$
$P = 50\ W$

$t = \frac{E}{P}$

$t = \frac{45\,000\ J}{50\ W}$

$\boxed{900\ s}$

6. A man used a computer for 7 hours and used 500 W of power. How much energy did it take to use the computer?

t = 7 h → × 60 × 60
P = 500 W
E = ?

$E = P \times t$
$E = 500\ W \times 25\,200\ s$

$\boxed{12\,600\,000\ J}$

or

$E = 0.5\ kW \times 7\ h$

$\boxed{3.5\ kWh}$

7. What is the potential difference of a light bulb when it uses a 200 Ω resistor and current of 0.4 A?

V = ?
R = 200 Ω
I = 0.4 A

$V = I \times R$
$V = 0.4\ A \times 200\ \Omega$

$\boxed{80\ V}$

8. A radio is on for 150 minutes and has 450 W of power. What is the energy in kWh?

t = 150 m ÷ 60
P = 450 W ÷ 1000
E = ? kWh

$E = P \times t$
$E = 0.45\ kW \times 2.5\ h$
$E = 1.125$

$\boxed{1.13\ kWh}$

9. A toaster takes 300 seconds to toast a piece of bread. If it uses 400 W of power how much energy will be used in J?

t = 300 s
P = 400 W
E = ? J

$E = P \times t$
$E = 400\ W \times 300\ s$

$\boxed{E = 120\,000\ J}$

10. What is the current intensity of a clock radio if it uses a 150 Ω resistor and 200 V?

$I = ?$
$R = 150\,\Omega$
$V = 200\,V$

$I = \frac{V}{R}$ $\quad I = \frac{200\,V}{150\,\Omega}$ $\quad \boxed{1.\overline{3}\ A}$

11. An oven is used for 35 minutes to bake cookies. Its voltage is 150 V and its intensity is 4 A. How much energy was used in J to baking the cake?

or $E = I \cdot V \cdot t$

$t = 35\,m \times 60$
$V = 150\,V$
$I = 4\,A$
$E = ?$

$E = P \times t$
$\downarrow$
$P = I \times V$

$P = 4\,A \times 150\,V$
$P = 600\,W$

$E = P \times t$
$E = 600\,W \times 2100\,s$
$\boxed{E = 1\,260\,000\ J}$

12. How much time passed in minutes when a computer did 50 000 J of work and had 550 W of power?

$t = ?\ m$
$E = 50\,000\,J$
$P = 550\,W$

$t = \frac{E}{P}$ $\quad t = \frac{50\,000\,J}{550\,W}$ $\quad \boxed{1.52\ m.}$

$t = 90.91\,s \div 60 =$

13. How much energy was used when a radio was on for 90 minutes and had 220 V and a current intensity of 2 A?

or ① $P = I \cdot V$ ② $E = P \cdot t$

$E = ?$
$t = 90\,m \rightarrow \times 60 = 5400\,s$
$V = 220\,V$
$I = 2\,A$

$E = I \cdot V \cdot t$
$E = 2\,A \times 220\,V \times 5400\,s$
$\boxed{E = 2\,376\,000\ J}$

14. What is the resistance of a resistor if a circuit is on for 2 hours, used 50 000 J of energy and 220 V?

$R = ?$
$t = 2\,h \times 60 \times 60 = 7200\,s$
$E = 50\,000\,J$
$V = 220\,V$

$P = \frac{E}{t}$
$P = \frac{50\,000\,J}{7200\,s} = 6.94\,W$

$I = \frac{P}{V}$
$I = \frac{6.94}{220\,V} = 0.32\,A$

$R = \frac{V}{I}$
$R = \frac{220}{0.32}$
$\boxed{R = 687.5}$

15. What is the power of an appliance if it works on 5 A and has a 3.5 Ω resistor?

$P = ?$
$I = 5\,A$
$R = 3.5\,\Omega$

$V = I \times R$
$V = 5 \times 3.5$
$V = 17.5\,V$

$P = I \times V$
$P = 5 \times 17.5$
$\boxed{P = 87.5\,W}$

16. What was the current intensity of a clock radio that used 20 000 J of energy when it was on for 2 hours and used a 110 V circuit?

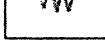
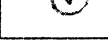
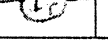
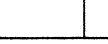
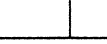
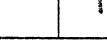
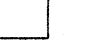
or $I = \frac{P}{V}$

$I = ?$
$E = 20\,000\,J$
$t = 2\,h \times 60 \times 60 = 7200\,s$
$V = 110\,V$

$P = \frac{E}{t}$
$P = \frac{20\,000}{7200} = 2.78\,W$

$I = \frac{P}{V}$
$I = \frac{2.78\,W}{110\,V}$
$\boxed{0.025\,A}$

17. Draw the symbols for the following:

Resistor	Voltmeter	Total voltage	Current (Ammeter)	Total current	Light	Wire	Switch	Power supply
								

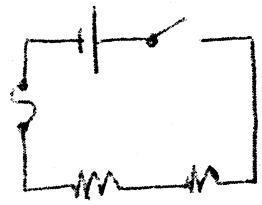
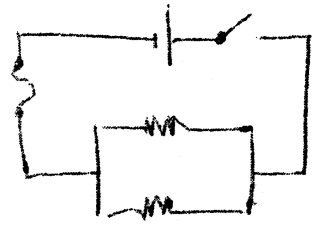
18. Fill in the table

	Series circuit	Parallel circuit
Give the definition	1 path for flow of electricity	circuit that contains more than 1 path

19. What are the 4 parts of a circuit and give their function?

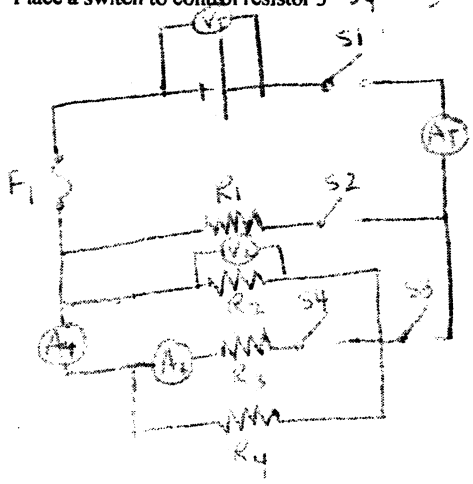
- power supply : supply energy to electrons
- 1 or more element that use electricity :
- wires : conduct electricity
- switch / fuse : turn power on/off

20. Draw a series and parallel circuit, each with two resistors. Include a switch and a fuse for the controlling the whole circuit.

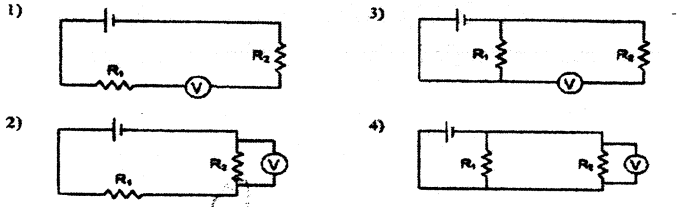
Series	Parallel
	

21. Draw a circuit where current intensity has 4 possible pathways. Use the specifics below when drawing the circuit

- Place a voltmeter that measures the potential difference coming from the power source, use Vt as your symbol. ✓
- Place a voltmeter that measures the potential difference across resistor R_2, use V_2 as your symbol. ✓
- Place an ammeter that measures the current intensity from the power source, use At as your symbol. ✓
- Place an ammeter that measures the current intensity through resistor R_3, use A_3 as your symbol. ✓
- Place an ammeter that measures the current intensity through resistor R_3 and resistor R_4, use A_4 as your symbol. ✓
- Place a switch that will cause the whole circuit to stop working when it is open. ✓ S1
- Place a switch that will cause resistor R_1 to stop working when it is opened. ✓ S2
- Place a switch that will cause resistors R_2, R_3, and R_4 to stop working when it is opened. ✓ S3
- Place a fuse to control the whole circuit F1 ✓
- Place a switch to control resistor 3 S4 ✓

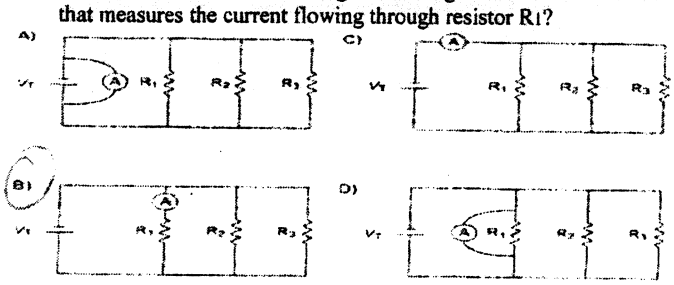


22. Four electric circuit diagrams are given below.
You wish to measure the potential difference across the terminals of resistor R2.
Which diagrams show a correctly connected voltmeter?



A) 1 and 3 B) 2 and 4 C) 1 and 2 D) 2 and 3

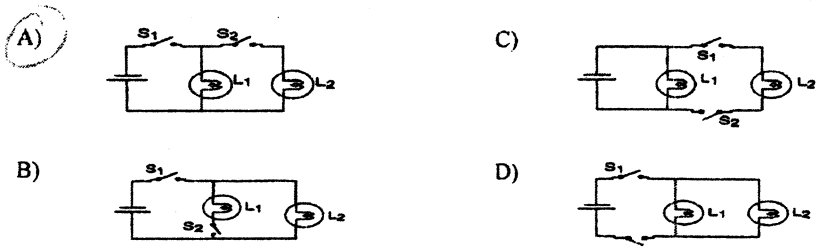
23. The following electric circuit consists of a power supply, V_T, connected to three resistors (R_1, R_2 and R_3). Which of the following circuit diagrams shows the correct connection for an ammeter A that measures the current flowing through resistor R_1?



24. An electrical circuit consists of a power source, two switches (S_1 and S_2) and two light bulbs (L_1 and L_2). The following table shows what happens to both light bulbs:

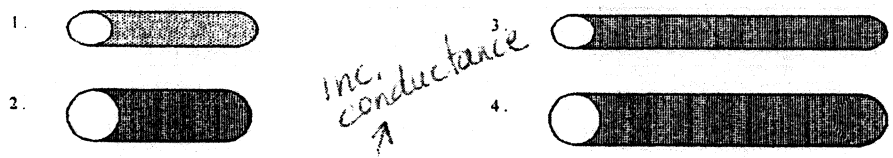
Switch		Light Bulb	
S_1	S_2	L_1	L_2
open	open	out	out
closed	open	bright	out

Which of the following circuit diagrams illustrates the results shown in the table above?



25. A circuit consists of a power supply, a light bulb and two terminals that can be connected to a rod.

The copper rods illustrated below are inserted into the circuit one at a time. The rods are the same temperature, but they have different dimensions.



inc. conductance

Which rod will offer the least resistance to the flow of electric current?

A) rod 1 B) rod 2 C) rod 3 D) rod 4

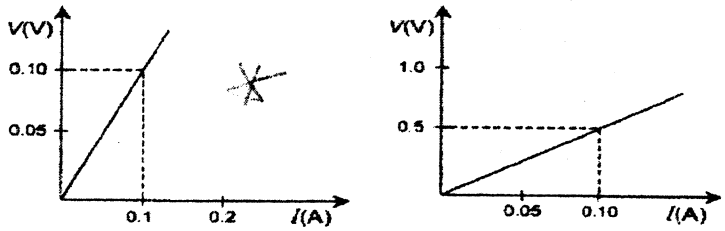
lowest resistance

26. The following table shows measurements related to four different resistors. Which of the resistors below has the most conductance? Justify your choice.

$R = \frac{V}{I}$

Resistor	Potential Difference (V)	Current Intensity (A)	
1	10	10	1 Ω
2	10	1	10 Ω
3	1	10	0.1 Ω
4	4	2	2 Ω

27. Which of the following graphs represents the conductor with the highest resistance? Jsutify.



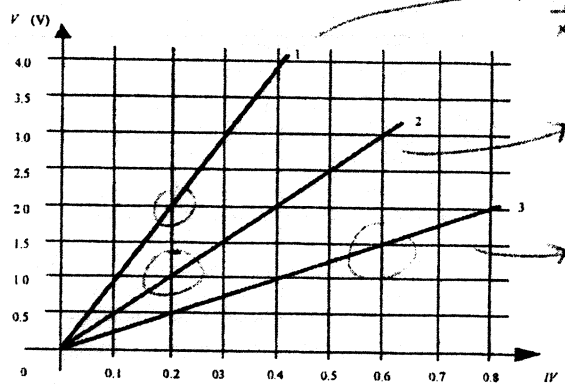
$\frac{\Delta y}{\Delta x}$ $\frac{y_2 - y_1}{x_2 - x_1}$ $\frac{y_2 - y_1}{x_2 - x_1}$

$\frac{0.1 - 0}{0.1 - 0}$ $\frac{0.5 - 0}{0.1 - 0}$

$\frac{0.1}{0.1}$ $\frac{0.5}{0.1}$

$1 \rightarrow \boxed{1\ \Omega}$ $5 \rightarrow 5\ \Omega$

28. The following graph describes the behavior of three resistors subjected to different voltages.



$\frac{y_2-y_1}{x_2-x_1}$ $\frac{2.0-0}{0.2-0}$ $\frac{2.0}{0.2}$ $10 \rightarrow 10.0$

$\frac{y_2-y_1}{x_2-x_1}$ $\frac{1.0-0}{0.2-0}$ $\frac{1.0}{0.2}$ $5 \rightarrow 5.0$

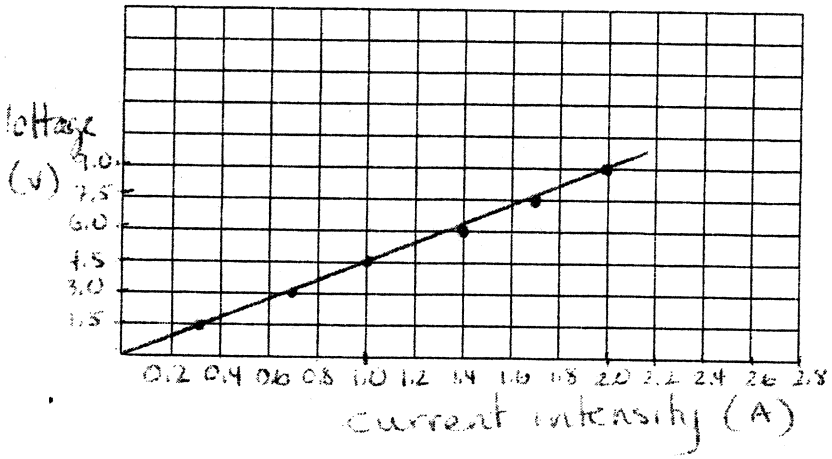
$\frac{y_2-y_1}{x_2-x_1}$ $\frac{1.5-0}{0.6-0}$ $\frac{1.5}{0.6}$ $2.5 \rightarrow \boxed{2.5}$

Which is the resistor would you use as the best conductor?
Justify your answer using calculations. → lowest R = #3

29. Use the results to answer the questions.

Voltage (V)	0	1.5	3.0	4.5	6	7.5	9
Current (A)	0	0.35	0.70	1.0	1.4	1.7	2.0

Draw a resistance graph



Find the resistance

$\frac{\Delta y}{\Delta x}$

$\frac{y_2-y_1}{x_2-x_1}$

$\frac{9.0-4.5}{2.0-1.0} = \frac{4.5}{1.0}$

$4.5 \Rightarrow \boxed{4.5\,\Omega}$

Topic 3 - Energy Efficiency and Heat

1. What is the energy efficiency formula?

$$\text{energy efficiency} = \frac{\text{amount useful E}}{\text{amount E consumed}} \times 100$$

2. An elevator has an energy efficiency of 64%. What amount of energy must the elevator consume in order to provide 95 kWh of useful energy?

$$\frac{64}{100} = \frac{95 \text{ kwh}}{x} \rightarrow \boxed{148.44 \text{ kwh}}$$

3. A microwave consumes 27 000 J of energy in order to provide 21 500 J of useful energy. What is its energy efficiency?

$$\frac{x}{100} = \frac{21\ 500 \text{ J}}{27\ 000 \text{ J}} \rightarrow \boxed{79.63\ \%}$$

4. A computer that is 87% efficient consumes 375 kWh of energy. How much useful energy does it provide?

$$\frac{87}{100} = \frac{x}{375 \text{ kwh}} \quad \boxed{326.25 \text{ kwh}}$$

5. A television that is 83% efficient provides 4 600 J of useful energy. How much energy does it consume?

$$\frac{83}{100} = \frac{4600 \text{ J}}{x} \quad \boxed{5542.17 \text{ J}}$$

6. An oven consumes 425 kWh of energy in order to provide 386 kWh of useful energy. What is its percent efficiency?

$$\frac{x}{100} = \frac{386 \text{ kwh}}{425 \text{ kwh}} \quad \boxed{90.8\ \%}$$

7. What are the 2 variables for heat?

(1) speed of particles

(2) mass of particles

June Review Term 3

Topic 1- Links and Guides and Systems

1. Fill in the table explaining what each term means.

Direct link	2 parts hold together without linking component	Removable	link can be removed without damaging parts or link
Indirect link	parts require a linking component	Non removable	separating parts damages parts or links
Complete	2 parts can't move independently	Rigid	linking component or surfaces are rigid
Partial	at least 1 part can move independently	~~Elastic~~ Flexible	linking components or surfaces can be deformed

2. For the following examples, state the 4 parts of a link that apply to it.

a- The cap of a pen:

direct – removable – complete – rigid

b- A poster of Justin Beiber scotch taped to the wall:

indirect – removable* – complete – flexible

3. What are the three types of guides?

1- translational
2- rotational
3- helical

4. What is the movement for a helical guide?

rotational + translational

5. What is the difference between a transformation and a transmission system?

relaying of more than 1 type of motion between parts

relaying of 1 type of motion from 1 part to another

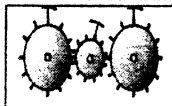
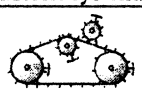
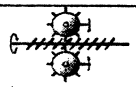
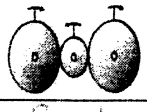
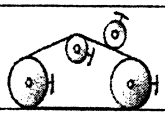
6. What do the terms driver, driven and intermediate mean?

component that receives force (starts motion)

component that receives motion

component between driver + driven

7. Name each transmission system.

				
gear train	chain + sprocket	worm + worm gear	friction gears	belt + pulley

8. From the systems listed in question 7, which is the only non-reversible one?

worm + worm gear

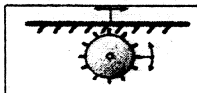
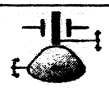
9. What is the formula to calculate speed change?

speed ratio $\frac{\#\text{ teeth driver gear}}{\#\text{ teeth driven gear}}$ or $\frac{\text{diameter driver pulle}}{\text{diameter driven pulle}}$

10. If the driver of a gear train has 40 teeth and the driven has 20 teeth, what is the speed change? What if the driver had 20 teeth and the driven had 40?

$\frac{40}{20} = 2 \rightarrow 2 \times$ the speed $\quad \frac{20}{40} = 0.5 \rightarrow 0.5 \times$ the speed

11. Name each transformation system and give the movement for each part.

			
rack + pinion	screw gear	cam + follower	slider-crank mechanis
rotation → transl or translation → rot.	rot → transl.	rotation → translation	rot → transl or transl → rot

Topic 2- Materials

1. Explain what a constraint is.

the effect of external forces on an object

2. Fill in the table by giving the description of the constraints below and give an example for each.

Compression	Tension	Torsion	Deflection	Shearing
crushing → ←	stretching ← →	twisting ↻	bending ↓ ↑ ↓	cutting → ←
crushing a can	tug of war	wringing a wet towel	fishing rod	scissors cutting paper

3. Explain the three types of deformations below.

Elastic	Plastic	Fracture
temporary change in shape	permanent change in shape	material breaks

4. Give the definition of the following properties.

Hardness	Elasticity	Resilience	Ductility	Malleability
ability to resist indentation or abrasion	ability to return to original shape	ability to resist shocks without breaking	ability to be stretched without breaking	ability to be flattened or bent without breaking
Stiffness	**Resistance to corrosion**	**Thermal conductivity**	**Electrical conductivity**	
ability to retain shape	ability to resist effects of corrosive substances	ability to transmit heat	ability to carry an electric current	

5. Give 2 main characteristics for each type of material

Wood and Modified wood	Ceramics	Metals and Alloys	Plastics	Composites
hardness elasticity resilience low conduct. many colours light	insulators hardness heat resistance low therm. cond. res. to corrosion fragile	shiny heat conduct elect. conduct ductile malleable	may resist heat (thermosetting) can be molded hard resistant degradation	durability lightness resilience stiffness conductivity

Topic 3- Biosphere and Biomes

1. Explain each layer

Lithosphere	Hydrosphere	Atmosphere	Biosphere
solid layer around Earth (crust, rock, sand)	layer of water	layer of air	layer around Earth containing all living organisms

2. What different compounds is carbon found in?

CO_2, CH_4, $C_6H_{12}O_6$, CO_3^{2-}

3. What is negative about methane and carbon dioxide?

↑ global warming (greenhouse effect)

4. Name different ways carbon dioxide is released into the environment.
- volcanic eruptions
- burning fossil fuels
- cellular respiration
- forest fires

5. What role does photosynthesis play in the carbon cycle?

$E + CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$

- uses carbon dioxide
- production glucose

6. Explain how fossil fuels are formed.
- dead organisms fall to ocean floor (or ground)
- sediments cover organism
- C in living org. changes to fossil fuels (ex coal, oil) over millions of years

7. Give characteristics of the following biomes:

Tropical	Boreal	Temperate	Grasslands
- equator - warm - 50-80% plants/animals - poor soil rich biodiversity	- north - conifers - lakes + marshes - acidic soils	- southern Canada, US, Europe (asia) - deciduous + conifers trees - rich soil	- prairies - temperate/Savannah/derived - resistant to drought + fire - little rainfall
Arctic tundra	**Deserts**	**Alpine**	**Lakes**
- no trees - north/poles - bushes/lichen/moss - permafrost	- very little rain - big diff temp day/night - rare plant life + few animals	- defined by altitude	- surrounded by land - little water movement - subject to pollution - shoreline - salinity < 0.05%
Rivers and streams	**Wetlands**	**Estuaries**	**Oceans and seas**
- fast current (↑ oxygen) - at higher altitudes - usu. more into lakes	- perm. or temp. covered with water - stagnant - marshes/swamps peat bogs	- between river + ocean - turbid water	- salinity > 3% - depth important (temp + type fauna)
Coral reefs			
- rich biodiversity - subject to overfishing, global warming, pollution			

Topic 4- Populations and Ecosystems

1. Define the term population.

   group of individuals from same species that occupy the same space (at one time)

2. In a forest, 24 chickadees were born, 17 flew in for the summer, 12 died because of the harsh winter and 7 emigrated because of the lack of resources. Was there a population increase or decrease during the year?

   $+24 + 17 - 12 - 7 \rightarrow \underline{+22}$ population increase

3. Explain what population density is.

   # individuals / unit of area or volume

4. You counted 150 dandelions in a 6 m^2 area. What is their population density?

   $\frac{150}{6m^2} : \frac{x}{1m^2}$ $25/m^2$

5. Give 2 examples of biotic and abiotic factors.

   - birth rate
   - food
   - competition
   - death rate
   - predation
   - disease

   - temperature
   - pH
   - precipitation
   - light
   - salinity
   - humidity

6. Draw what each type of population distribution would look like.

Clumped	Uniform	Random
		

7. Explain what a limiting factor is.

   ecological factor that causes the density of a population to decrease

8. The X's, O's, W's and T's represent different populations in a community.

X T T TTO O X T T T T TO O X TT T TO O W

A- Calculate the relative abundance of each species.

X - 3/23 13%
W - 1/23 4%
T - 13/23 57%
O - 6/23 26%

B- Do you believe this community has a high biodiversity? Explain.

no, (1) species richness is low (only 4 species)
and
(2) relative abundance values are not similar (ex. 57% of pop. is "T")

9. Use the graph to answer the questions.

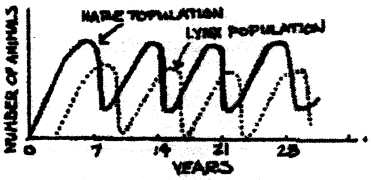
A-What causes the lynx population to increase? ↑ hare

B- What causes the hare population to decrease? ↑ lynx

C- What causes the lynx population to decrease? ↓ hare

D- What causes the hare population to increase? ↓ lynx

E- How long does this cycle last? 7 years

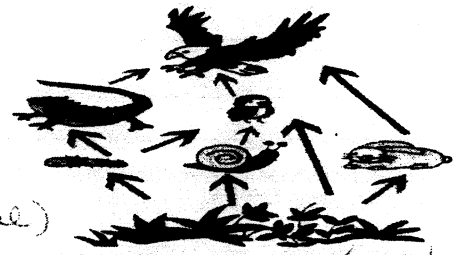


10. Define and give examples of the following words.

	Definition	Example
Mutualism	both organisms benefit from relationship	sea anemones + clown fish ants + aphids
Predation	relationship where 1 organism feeds on another	wolf + caribou mouse + eagle
Parasitism	type of predation parasite gets food from living host	caterpillar eating leaves tapeworm in human intestine
Commensalism	relationship where one organism benefits, other is unaffected	nest in tree
Competition	interaction between 2 organisms that want access to same resource in habitat	• intraspecific (2 birds wanting to attract same mate) • interspecific (lynx + fox looking for food)

11. Define the following terms and give an example of each.

	Ecosystem	Producer	Consumer	Decomposer
Definition	community of living org. interacting	introduce energy into env. and transform inorg. material into org. material	heterotrophs feed on other organisms	feed on wastes + remains of living organisms
Example	Rainforest	plants, algae bacteria	rabbit, deer wolf, us	worms, bacteria fungi



12. Using the picture, answer the following questions:

a- Name a secondary producer?

lizard, bird, eagle

b- Can the bird be a primary and secondary consumer?

only secondary (eats an animal)

c- Make a food chain with 3 consumers

caterpillar → lizard → eagle / caterpillar → bird → eagle / snail → bird → eagle

d- Give a consequence of the lizard being taken out of the food web.

↑ # caterpillars

↓ # eagles

13. Explain why the sun is necessary for the energy flow between trophic levels.

sun provides energy for producers

14. Explain what biomass is.

total mass of all organic matter (plants + animals) in an ecosystem

15. What is primary productivity and what is it influenced by?

- amount of new biomass made by producers in an ecosystem
- influenced by
  - amount of light
  - amount of water
  - nutrients
  - temperature

Topic 5- Earth and Space

Refer to the notes you just received.