

Answers 2017

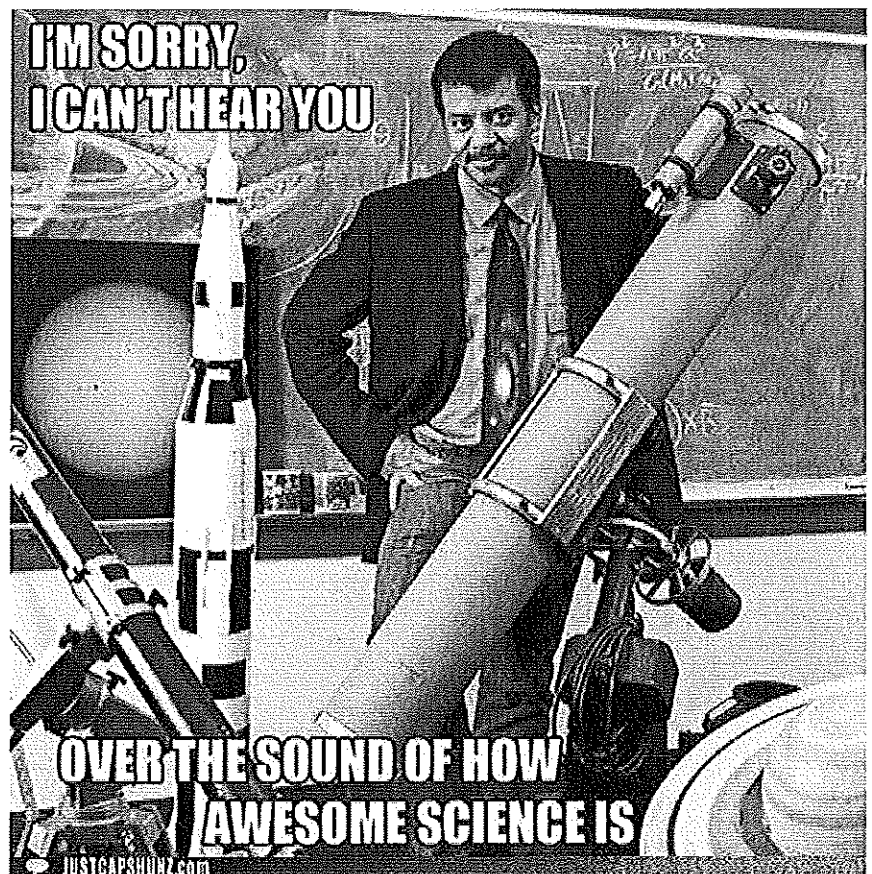
Standards

Swan Christian College

Year 10 Science

Some examination revision

Note: There was not a lot on covalent bonding, make sure you can draw electron-dot/Lewis structures and write the chemical formulae.



Chemical Science

1. When an atom loses an electron:

- a a positive ion is formed
- b a negative ion is formed
- c the atomic number is changed
- d the mass number is changed

Explain your answer

electrons are negatively charged. Losing an electron makes the atom more positive.

2. The elements sodium, lithium, potassium and caesium all form ions with a charge of:

- a 1+
- b 2+
- c 3+
- d 1+ and 2+

To what group of the periodic table do these elements belong? Explain why they form ions of this charge?

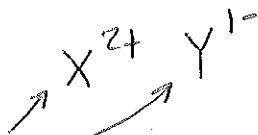
Group 1
They all have only one valence electron which is lost.

3. An unknown substance (X) was found to combine with chlorine to form an ionic compound of XCl_3 . How many valence electrons does element X have?

- A 1
- b 2
- c 3
- d 4

What are valence electrons?

Electrons in the outermost shell of an atom.



4. Hypothetical element X, which has 2 electrons in its outermost shell, is reacted with element Y, which has 7 valence electrons. Which of the following statements is INCORRECT?

- A The ions formed are X^{2+} and Y^- . ✓
- b The compound has the formula XY_2 . ✓
- C Element X donates electrons to element Y. ✓
- (d) The compound formed is covalent. ✗

Explain why the statement is incorrect.

ionic bonds give and take electrons. Covalent bonds share them. Ions form ionic bonds because of their opposite charges.

5. Complete the table below, which shows the structure of a number of atoms. Use your periodic table as required.

Name of element	${}^A_Z E$	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons	Electron configuration
Neon	${}^{20}_{10} Ne$	10	20 20	10	$20 - 10 =$ 10	10	2 8
			31		16		
Potassium	${}^{39}_{19} K$	19	39	19	20	19	2,8,8,1

6. Name the following compounds:

- ionic a. CuS Copper sulfide
- ionic b. $Al(OH)_3$ Aluminium hydroxide
- ionic c. NaF Sodium Fluoride
- covalent d. SO_3 Sulphur trioxide

← You should have memorised OH^- is a hydroxide.

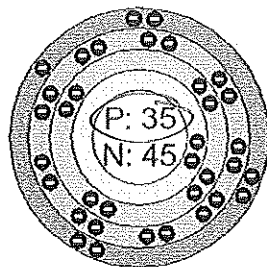
7. Write the formula of the following substances:

- a. Magnesium iodide $Mg^{2+} I^{1-} \rightarrow MgI_2$
- b. Silver nitrate $Ag^{1+} NO_3^{1-} \rightarrow AgNO_3$
- c. Carbon tetrachloride CCl_4
- d. Iron Fe

We will let you know charges of transitionals (Standard)

Use your polyatomic table to identify.

8. A student draws the diagram below to represent the electron configuration of a neutral atom.



Note: You can figure this because of the diagram. we expect you to follow 2,8,8,2 rule otherwise.

- a What is the name of the element? Bromine
- b Write the electron configuration for the element 2, 8, 18, 7
- c To what group of the periodic table does the element belong? Explain how you made your decision.

non-metals

- d If this atom was to form an ion what would be its charge? Why?

1⁻ charge. Because it has 7 valence electrons and requires one electron to reach '8 is great' rule.

The next two questions are based on the following table, which summarizes the properties of four different substances numbered I, II, III and IV.

Substance	Melting Point (°C)	Electrical Conductivity in Solids	Electrical Conductivity in <u>Molten State</u>	Hardness and Malleability
I	-7	Non-Conductor	Non-Conductor	Soft
II	1083	Good Conductor	Good Conductor	Hard and Malleable
III	801	Non-Conductor	<u>Conducts electricity</u>	Hard and <u>brittle</u>
IV	3550	Non-Conductor	Non-Conductor	Hard and <u>brittle</u>

ie. salts
ie. diamond

9. Which substance would be classified as ionic?

- a) I
- b) II
- c) III
- d) IV

10. Which substance would be classified as a covalent network solid?

- a) I
- b) II
- c) III
- d) IV

11. Give the name of the following, and state the type of bonding (metallic, covalent network, covalent molecular or ionic) that is present.

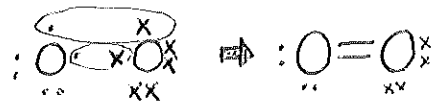
SUBSTANCE	NAME	BONDING TYPE
Ca	Calcium	metallic
SiO ₂	Silicon dioxide	covalent molecular
CaO	calcium oxide	ionic
NH ₃	nitrogen	
NH ₄ Cl		

12. Give the electron configuration for -

- Carbon 2, 4
- Argon 2, 8, 8
- Sodium 2, 8, 1

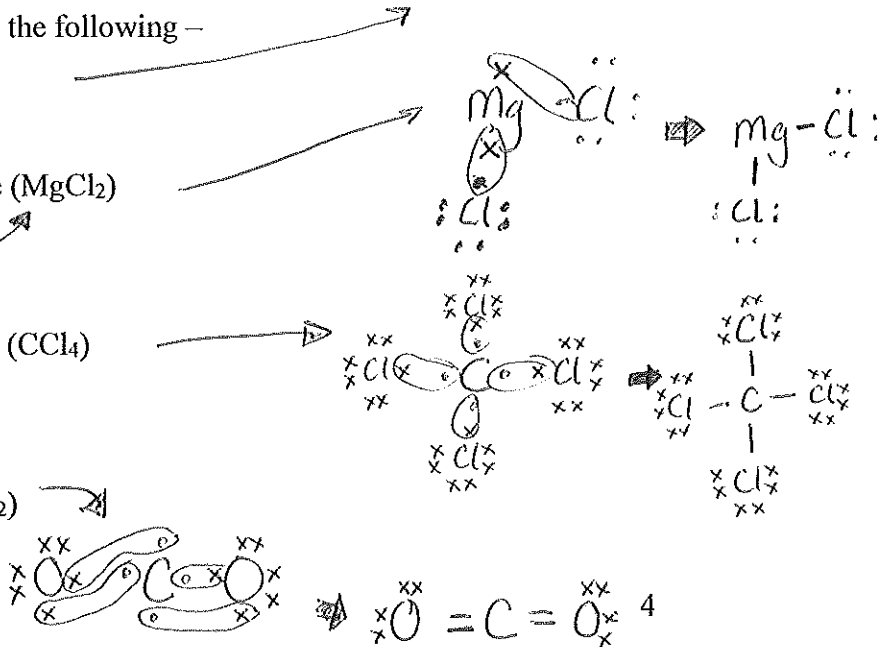
When oxygen forms an ion it gains 2 electrons = O²⁻ so it has a total of 10 electrons.

Oxide ion 2, 8



13. Draw electron dot diagrams for the following -

- a. oxygen gas (O₂)
- b. magnesium chloride (MgCl₂)
- c. carbon tetrachloride (CCl₄)
- d. carbon dioxide (CO₂)



Note: Here we have given the equation... would you be able to figure it out without it?

Note: Some information you can access using your polyatomic table. If there are chemicals not on their or available using your periodic table then don't stress. We will provide them in the test.

14. Complete the following table by giving the correct chemical formula for the named molecules. i.e.

Barium phosphate	$Ba^{2+} P^{3-} = Ba_3P_2$	Sodium oxide	
Potassium sulfide	K_2S	Silver sulfate	
Ammonium carbonate	$(NH_4)_2CO_3$	Magnesium nitrate	
Tin II hydroxide	$Pb^{2+} OH^{-} = Pb(OH)_2$	Zinc phosphate	
Sodium sulfide	Na_2S	Potassium sulfate	
Silver carbonate	Ag_2CO_3	Ammonium hydrogen carbonate	
Sodium fluoride	NaF	Tin IV chloride	
Silver bromide		Ammonium iodide	
Magnesium sulfate		Calcium carbonate	
Zinc hydrogen carbonate		Barium hydrogen sulfate	
Iron II nitrate		Cobalt hydroxide	
Potassium bromide		Silver iodide	
Magnesium carbonate		Calcium hydrogen carbonate	
Zinc hydrogen sulfate		Barium nitrate	
Copper II phosphate		Iron III hydroxide	
Sodium bromide		Potassium iodide	
Silver oxide		Ammonium sulfide	
Calcium hydrogen sulfate		Zinc nitrate	
Sodium hydroxide		Iron II phosphate	
Sodium sulfite		Potassium oxide	
Silver sulfide		Ammonium sulfate	
Calcium nitrate		Zinc hydroxide	
Sodium ethanoate		Potassium permanganate	
Iron III hydrogen carbonate		Copper I fluoride	
Aluminium sulfide		Manganese bromide	
Iron III oxide		Lead II sulfate	

These are all ionic bonds.

15. Complete the following table that gives the name of some common acids and their formulas. The first has been done for you.

You will be given the formula (standard)

Name of acid	Formula
Hydrochloric acid	HCl
Sulfuric acid	
	HNO ₃
Phosphoric acid	
Carbonic acid	
	CH ₃ COOH

16. Complete these general word equations for chemical reactions:

Acid + Reactive Metal → salt + hydrogen gas

Acid + Metal Oxide → salt + water

~~Acid + Metal Hydroxide → _____ + _____~~

Acid + Carbonate → salt + water + carbon dioxide

~~Acid + Hydrogencarbonate → _____ + _____ + _____~~

Acid + Base → salt + water

Metal + Oxygen → oxide

~~Non-metal + Oxygen → _____~~

[K, Na, or Ca] + water → hydroxide + hydrogen gas

[Al, Zn, Fe, Ni, Sn, or Pb] + steam → oxide + hydrogen gas

[Cu, Hg, Ag, Pt, or Au] + water/steam → no reaction

17. Identify the following substances by choosing a name from the box. Write the correct name next to the substance.

Metal hydroxide	Non-metal oxide	Metal Oxide
Metal carbonate	Metal hydrogencarbonate	Metal ion
Metal	Salt	

Al₂O₃ metal oxide

CaCl₂ salt

Ni metal

Mg²⁺ metal ion

Fe(OH)₃ metal hydroxide

Zn(CO₃) metal carbonate

SO₃ non-metal oxide

KHCO₃ metal hydrogen carbonate

18. Convert the following word equations to symbol form and then balance them. Write your balanced equation underneath the word equation

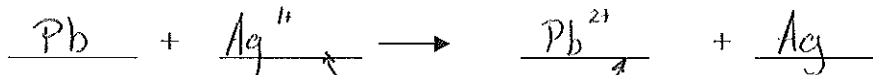
A. calcium + water \longrightarrow calcium hydroxide + hydrogen gas



B. zinc metal + nitric acid \longrightarrow zinc nitrate + hydrogen gas



C. lead + silver ions \longrightarrow lead II ions + silver



An anion would be bonded here

19. Write the word equations below as chemical equations and balance:

a. Zinc and lead (II) nitrate react to form zinc nitrate and lead.



b. Aluminum bromide and chlorine gas react to form aluminum chloride and bromine gas.



c. Sodium phosphate and calcium chloride react to form calcium phosphate and sodium chloride.

d. Potassium metal and chlorine gas combine to form potassium chloride.

e. Aluminum and hydrochloric acid react to form aluminum chloride and hydrogen gas.

f. Calcium hydroxide and phosphoric acid react to form calcium phosphate and water.

Not balanced yet.

← Not sure about this one. I am assuming you are just noting the single displacement

Remember: We will provide charges if they are in the transitional elements (Standard)

g. Copper and sulfuric acid react to form copper (II) sulfate and water and sulfur dioxide.

h. Hydrogen gas and nitrogen monoxide react to form water and nitrogen gas.

20. Using the Activity Series of Metals, fill in the table below, to show what solid will form (if any) if the metals are put in solutions of tin chloride and copper iodide. If you think nothing will happen, write "no reaction".

METALS:	in tin chloride solution	in copper iodide solution
Aluminium (Al)	Tin metal forms	Copper metal forms
Tin (Sn)	<u>no reaction</u>	Copper metal forms
Silver (Ag)	<u>no reaction</u>	<u>no reaction</u>

21. Write balanced equations for the following reactions. [6 marks]

Na ⁺ O ²⁻	Sodium + cold water	<u>Na (s)</u> + <u>H₂O (l)</u> → <u>Na₂O</u> + <u>H₂ (g)</u> - unbalanced
Zn ²⁺ SO ₄ ²⁻	zinc + dilute sulfuric acid	<u>Zn (s)</u> + <u>H₂SO₄ (aq)</u> → <u>ZnSO₄</u> + <u>H₂ (g)</u> - balanced as is.
Al ³⁺ O ²⁻	Aluminium + superheated steam	<u>Al (s)</u> + <u>H₂O (g)</u> → <u>Al₂O₃ (s)</u> + <u>H₂ (g)</u> - unbalanced.

see your polyatomic table for charge (standard)

22. Balance the equations below:

- a) $\underline{\quad}$ CH₄ + $\underline{2}$ O₂ → $\underline{\quad}$ CO₂ + $\underline{2}$ H₂O
- b) $\underline{\quad}$ C₃H₈ + $\underline{5}$ O₂ → $\underline{3}$ CO₂ + $\underline{4}$ H₂O
- c) $\underline{\quad}$ FeCl₃ + $\underline{3}$ NaOH → $\underline{\quad}$ Fe(OH)₃ + $\underline{3}$ NaCl
- d) $\underline{2}$ Na + $\underline{2}$ H₂O → $\underline{2}$ NaOH + $\underline{\quad}$ H₂
- e) $\underline{2}$ Ag₂O → $\underline{4}$ Ag + $\underline{\quad}$ O₂
- f) $\underline{\quad}$ CO₂ + $\underline{\quad}$ H₂O → $\underline{\quad}$ C₆H₁₂O₆ + $\underline{\quad}$ O₂
- g) $\underline{\quad}$ K + $\underline{\quad}$ MgBr₂ → $\underline{\quad}$ KBr + $\underline{\quad}$ Mg
- h) $\underline{\quad}$ H₂O + $\underline{\quad}$ O₂ → $\underline{\quad}$ H₂O₂
- i) $\underline{\quad}$ NaBr + $\underline{\quad}$ CaF₂ → $\underline{\quad}$ NaF + $\underline{\quad}$ CaBr₂
- j) $\underline{\quad}$ H₂SO₄ + $\underline{\quad}$ NaNO₂ → $\underline{\quad}$ HNO₂ + $\underline{\quad}$ Na₂SO₄

For the remainder,
use www.webqc.org
balancing generator to
check your answers.

23. Main reactions involving acidic substances

For the following reactions, (1) complete the word equation; (2) complete and balance the chemical equation provided.

refer to question 16 (pg. 6)

- a) Acid + Metal Hydroxide → _____ + _____
 $\underline{\quad}$ H₂SO_{4(aq)} + $\underline{\quad}$ Fe(OH)_{2(aq)} → _____ + _____
- b) Non-Metal Oxide + Metal Hydroxide → _____ + _____
 $\underline{\quad}$ CO_{2(g)} + $\underline{\quad}$ Ba(OH)_{2(aq)} → _____ + _____
- c) Acid + Metal Oxide → _____ + _____
 $\underline{\quad}$ HNO_{3(aq)} + $\underline{\quad}$ Al₂O_{3(s)} → _____ + _____
- d) Acid + Metal Carbonate → _____ + _____ + _____
 $\underline{\quad}$ HCl_(aq) + $\underline{\quad}$ CaCO_{3(s)} → _____ + _____ + _____
- e) Acid + Hydrogencarbonate → _____ + _____ + _____
 $\underline{\quad}$ H₂SO_{4(aq)} + $\underline{\quad}$ KHCO_{3(aq)} → _____ + _____ + _____

24. Write the **NET IONIC** equations below as chemical equations and balance:

- a. Aluminum and hydrochloric acid react to form aluminum chloride and hydrogen gas.
- b. Calcium hydroxide and phosphoric acid react to form calcium phosphate and water.
- c. Copper and sulfuric acid react to form copper (II) sulfate and water and sulfur dioxide.
- d. Hydrogen gas and nitrogen monoxide react to form water and nitrogen gas.

25. The solutions below are **mixed**. For each of the mixtures, predict whether or not a chemical reaction will occur. Where a reaction occurs, indicate both the **molecular equation** and **net ionic equation**. If a reaction does not occur, write 'no reaction'.

a **silver nitrate and potassium chloride**

Molecular equation:

Net ionic equation:

b **sulphuric acid and Sodium metal**

Molecular equation:

Net ionic equation:

c **sodium nitrate and potassium chloride**

Molecular equation:

Net ionic equation:

insoluble = (s)

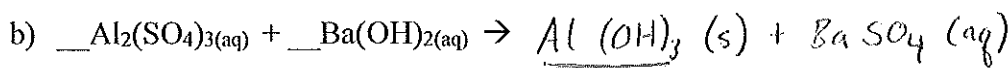
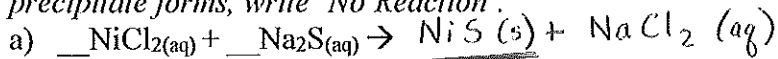
soluble = (aq)

Reactions producing precipitates

26. Use the solubility rules to determine if the following ionic solids are soluble in water.

- a) CuCO_3 - insoluble
- b) MgCl_2 - soluble
- c) Zn(OH)_2 - insoluble
- d) $\text{Ca}_3(\text{PO}_4)_2$ - insoluble

27. Write ionic equations for each of the following precipitate forming reactions. If no precipitate forms, write 'No Reaction'.



Use your solubility rules to determine. If no (s) forms then No Reaction!

Displacement Reactions

28. A student was given a shiny grey metal and asked to identify what element it is composed of. The metal was placed in different solutions to see if it would react. It was found that it reacted with copper(II) sulfate solution but not with zinc nitrate solution.

a) Which metal (or metals) could the rod be made of?

see below

b) ~~What other test could be done to determine the identity of the metal?~~

Data and Tables

Activity Series

K
Na
Ca
Al
Zn
Fe
Ni
Sn
Pb
Cu
Hg
Ag
Pt
Au

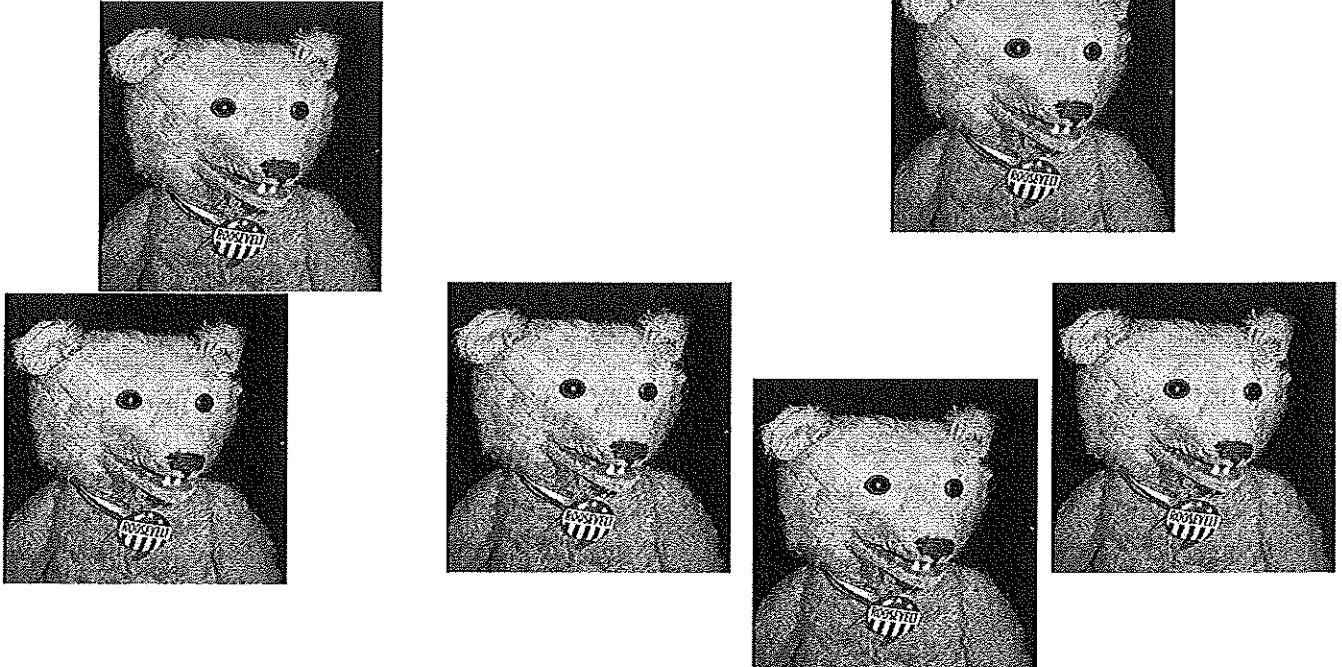
Element X doesn't react

Element X reacts

It could be any of these.

Biology

1. Observe the following population of teddy bears.



2. Will natural selection be able to act on this population? Why or why not?

No. There appears to be no variation in the population.
specifically DNA →

3. After several millions of years, the following mutant arose in the teddy bear population.



This mutant found it could eat more food types than the normal type teddy. For example, it could chew up vegetables and hard biscuits whereas the normal type teddy was stuck eating soft foods like cake and marshmallows. However, the mutant was also much more susceptible to tooth decay and cavities.

4. In what type of situation would the mutant teddy be at a *disadvantage*, resulting in it's genes not being passed on, and it's type dying out?

Where it only has sugary foods to eat resulting in more deaths from tooth decay.

5. Describe a situation where the mutant type teddy would be at an *advantage*. Name the selective pressure in this situation.

Where there is only hard ~~to~~ food available resulting in the toothless ones dying out.

6. The environmental factor that causes a change in a population is said to be imposing

- a) artificial selection
- b) selection pressure
- c) sexual selection
- d) evolution

7. Explain what *sexual selection* is.

When a mating season, call, dance etc determines when/if a species will mate with another.

8. How might sexual selection help the survival of a species?

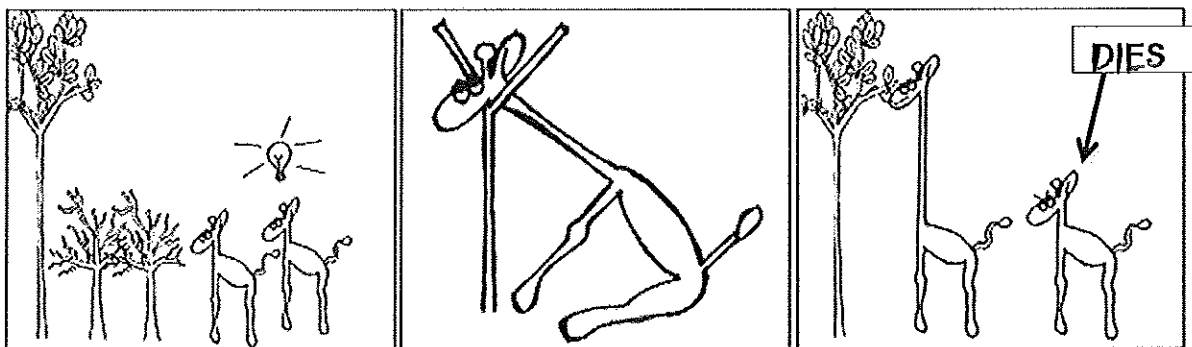
9. Name some types of variation that can be found in a cat population.

- leopards, house cats, lions.
- in house cats there are different colours, hair types, eye colour etc.

10. Give the genetic definition of natural selection

Those genes that are favourable will be passed on to the offspring.

11. The following diagram illustrates a theory of evolution that was proposed before Darwin proposed his theory.



Eg. Giraffes stretch their necks in order to reach the higher trees. When the smaller trees dies out, the giraffe with the longer (stretched) neck survives, and passes the long neck onto its' offspring.

Explain what is wrong with this theory, in light of our current understanding of genetics.

- This is Lamarck Theory of Aquired characteristics.
- It is wrong since removing a limb doesn't mean the offspring are born without that limb.
- It is the DNA, ~~gene~~ that determines the structures.

12. In the example of the peppered moths;

a) What moth types existed before the tree colours changed?

peppered (white with black spots)

b) What moth types existed after the tree colours changed?

black + peppered

c) Was any new genetic information added to the moth population?

no, there was already an expression of black in the population.

d) What actually *did* change in the moth population?

natural selection acting on the population (predation of birds)

e) If there had only been light coloured moths in the population, what would have happened to the moth population?

Possibly died out

13. a) What ~~was~~^{is} the pesticide resistance in some insects due to?

no genetic resistance to the pesticide.

b) What happens every time the farmer sprays with the same pesticide?

it kills those without the resistance. this means that those with the resistance can reproduce.

c) What is the selective agent in this case? pesticide

d) This is an example of

i) artificial selection

ii) natural selection

iii) sexual selection

iv) environmental pressure

14. The name for the genetic makeup of an organism is DNA (genotype)

The name for the characteristics of an organism is it's phenotype

not assessable.

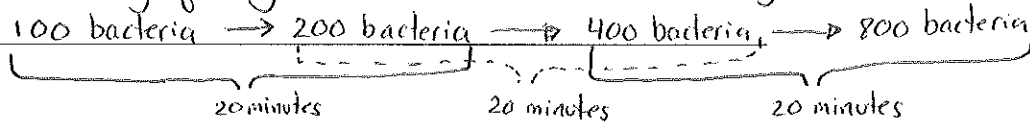
15. a) Is it correct to say that bacteria 'become' resistant to antibiotics? No

If not, why not? The ones who are not resistant die. Those that are survive and pass on their genes.

b) How do bacteria reproduce, and how fast does this occur?

• binary fission (one cell divides into two)

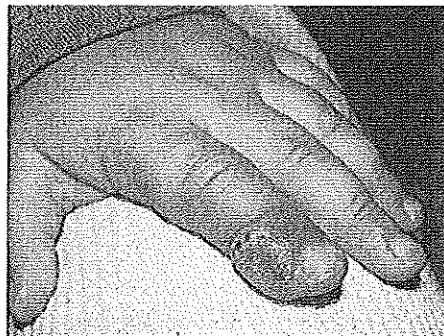
• Very quickly. Bacteria can replicate every 4-20 minutes.



c) What will you need to do if you are infected with bacteria that are resistant to the antibiotic you are using?

No you dont need to commit harakiri!

You would need to take a different type of antibiotic.



d) How is antibiotic resistance beneficial to the bacteria?

It ensures they survive.

Note: Bacteria are important for natural decay and decomposition, making different types of cheese, used in vaccines etc.

e) If a population of bacteria becomes resistant to an antibiotic (over several generations), can you say evolution has occurred? Why or why not?

No you cant. They are still bacteria, just bacteria that are resistant to an antibiotic.

16.

a) What are the two main sources of genetic variation?

mutation
(gene recombination) ← not assessed since meiosis not covered.

b) Prior to the use of antibiotics, humans still had some defence against bacterial infection.

What was/is it? immune system

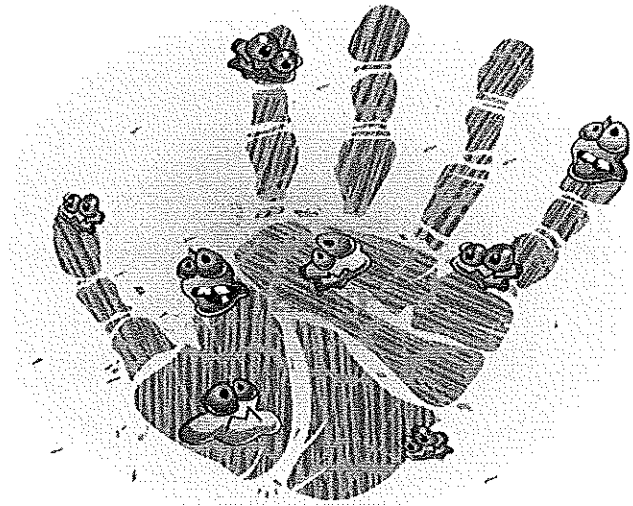
c) Name some factors that have contributed to the increase in the number of antibiotic resistant bacteria

- wide use of antibiotics (more bacteria having natural selection act on them)
- not finishing an antibiotic dose. (allows bacteria to survive)
- Poor general hygiene + sanitation (more bacteria strains)

Not assessable!

d) Name an alternative to antibiotics that has been used to greatly reduce the incidence of bacterial infection. Bacteriophages (viruses that kill bacteria)

e) How could bacteria that have never been exposed to antibiotics, contain antibiotic resistant genes?



- They inherited the genes
- They have a natural resistance (mutation)

Below are descriptions of four female mice that live in a beach area which is mostly tan sand with scattered plants.

1. According to the definition for fitness, which mouse would biologists consider the fittest? Explain why this mouse would be the fittest.

Color of fur	Brown	Tan	Tan and Brown	Cream
Age at death	2 months	8 months	4 months	2 months
# pups produced by each female	0	11	3	0
Running speed	8 m/min.	6 m/min.	7 m/min.	5 m/min.

2. If a mouse's fur color is generally similar to its mother's color, what color fur would be most common among the pups?

A more complete definition of fitness is the ability to survive and produce offspring who can also survive and reproduce. Below are descriptions of four male lions.

3. According to this definition of fitness, which lion would biologists consider the "fittest"? Explain why.

Name	George	Dwayne	Spot	Tyrone
Age at death	13 years	16 years	12 years	10 years
# cubs fathered	19	25	20	20
# cubs surviving to adulthood	15	14	14	19
Size	250 cm	210 cm	225 cm	225 cm

Suppose that Tyrone had genes that he passed on to his cubs that helped his cubs to resist infections, so they were more likely to survive to adulthood. These genes would be more common in the next generation, since more of the cubs with these genes would survive to reproduce. A characteristic which is influenced by genes and passed from parents to offspring is called **heritable**. Over many generations heritable adaptive characteristics become more common in a population. This process is called **evolution by natural selection**. Evolution by natural selection takes place over **many, many** generations.

