

NAME: _____

DATE: _____

**APPLIED SCIENCE AND TECHNOLOGY (SEC. 3)
JANUARY 2015 MID-YEAR EXAM REVIEW PACKAGE**

Answer the questions on a separate piece of paper.

1. What is matter?
2. Name the two different types of mixtures, and give an example of each.
3. Draw the particle model for a solid, a liquid and a gas. Explain how the particles interact in each case.
4. What are the four points of the particle model?
5. Label the following as either an element, a compound, a solution, or a colloid:
 - a) black coffee
 - b) iron
 - c) sugar
 - d) homogenized milk
6. In which state of matter are the particles moving:
 - a) the quickest?
 - b) the slowest?
7. What is the formula for density? What are the two acceptable units for density?
8.
 - a) If you have 5 000 mL of a substance that has a mass of 5 kg, what is its density?
 - b) If you have a cylinder that has a volume of 220 cm³ and a mass of 391 g, what is its density?
 - c) If an unknown liquid has a density of 1.8 g/mL and you use 30 mL, what is the mass of this liquid?
9. Label the following as either mixtures or pure substances:
 - a) air
 - b) oxygen
 - c) silver
 - d) copper
 - e) milk
 - f) stainless steel
 - g) mayonnaise
 - h) distilled water
10. Label the following as either homogeneous or heterogeneous mixtures. Then state whether the homogeneous mixtures are solutions or colloids.
 - a) tea
 - b) milk
 - c) whipped cream
 - d) dirt
 - e) blood
 - f) Jell-o with fruits
 - h) hair gel
 - i) coffee with milk
11. An 800 mL salt solution with a concentration of 22 g/L will contain what amount of salt?
12. Which of the following solutions is most concentrated:
 - a) 5 grams in 400 mL
 - b) 0.035 kg in 1500 mL
 - c) 10 grams in one litre
13. Calculate the volume of a 12 g/L sugar solution containing 50 g of sugar.
14. What volume of a 6 g/L peroxide solution is needed to prepare a 2 g/L peroxide solution with a volume of 654 mL?
15. A 0.8 g/L alcohol solution with a 400 mL volume is diluted by the addition of 800 mL of water. Calculate the dilute concentration.
16. A 25 g/L acetone solution with a volume of 35 mL is diluted to a concentration of 10 g/L. Calculate the volume of the dilute solution.
17. The solubility of barium chloride is 360 g/L. How much barium would you need to make a 100 mL of saturated solution?
18. The solubility of calcium chloride is 425 g/L. If I put 80 grams of calcium chloride in 75 mL of water, will I have an unsaturated, a saturated, or a supersaturated solution?
19. Glucose has a solubility of 1000 g/L. If I put 225 grams of sugar in 400 mL of water, how much more glucose will I need to add to make a saturated solution?

20. Which of the separation techniques we used:
a) rely on gravity (2) b) rely on spinning c) need to keep the liquid that boils off
d) rely on the movement of a solvent up a paper e) don't care if we keep the solvent
21. Name all of the separation techniques that you could use to separate sand from water?
22. Name all of the separation techniques that you could use to separate salt from water?
23. Which of the separation techniques could you use to separate different types of medicines dissolved in water?
24. Which of the separation techniques could you use to separate acetone, a liquid that has a boiling point of 57°C, from water, which has a boiling point of 100°C?
25. Name four physical properties of matter that you can test in a lab.
26. Which chemical property does each of the following tests analyze?
a) reaction to red litmus paper b) reaction to blue litmus paper c) reaction to cobalt chloride paper
d) reaction to limewater e) glowing wood splint f) burning wood splint g) open flame test
27. Some unknown chemicals are tested in the lab. Using the table in Appendix 1 of your textbook, find the name of each unknown chemical:
a) colourless, odourless gas, density of 0.0014 g/mL, supports combustion, doesn't burn, boils at -183°C
b) white solid crystals with a solubility of 425 g/L and a boiling point of 1935°C
c) grey solid, shiny, malleable, conducts electricity well, doesn't oxidize much, melting point of 3410°C
d) clear, colourless liquid that smells sweet, density of 1.26 g/mL, catches on fire easily
28. What is energy? What is the unit used to describe energy?
29. What are the four main types of energy that we study in chapter 2?
30. Label the following forms of energy as radiant, mechanical, thermal, or chemical.
a) microwaves b) a fan blade turning c) gasoline burning d) heat radiating out from a stove
e) sunlight f) energy the body gets from eating sugar g) ocean waves eroding rocks h) melting snow
31. Which of the following affects thermal energy? (circle all the correct answers)
a) the position of the molecules b) the number of molecules c) the size of the molecules
d) the speed of the molecules
32. Which of the following affects radiant energy? (circle all the correct answers)
a) the speed of the waves b) the wavelength of the waves c) the frequency of the waves
d) the size of the waves
33. Which of the electromagnetic waves...:
a) can be seen by the eye? b) have the lowest energy? c) have the highest energy? d) cause skin cancer?
e) feel warm? f) have wavelengths longer than infrared light(2)? g) heat up your food(2)?
h) go through your body(2)? i) can treat certain cancers?
34. What energy is stored in the bonds between atoms in molecules?
35. Which of the following affects chemical energy? (circle all the correct answers)
a) how big the atoms are b) the strength of the bond between atoms c) the movement of the atoms

36. Which of the following are examples of chemical energy? (circle all the correct answers)
- a) burning gas in a car's motor
 - b) chopping celery
 - c) photosynthesis
 - d) burning wood in a campfire
 - e) heating up food in the oven
 - f) cellular respiration
 - g) receiving a text message on your cell phone
37. What are the three factors that affect mechanical energy?
38. Which would have more energy in each example?
- a) A ping pong ball going 50 km/hr or a car going 50 km/hr?
 - b) A 2 kg rock falling off a building or a 5 kg rock falling off a building?
 - c) A 1 kg rock falling from 1 m or a 1 kg rock falling from 10 m?
 - d) A dart thrown by hand (40 km/h) or a dart thrown by an air gun (100 km/h)?
39. Which of the following are examples of mechanical energy? (circle all the correct answers)
- a) an asteroid hitting the earth
 - b) a rock landing in water and making a splash
 - c) fireworks exploding
 - d) water pushing a boat down a river
 - e) a campfire warming you
 - f) tearing a piece of paper
40. State which of the following are transfers or transformations of energy:
- a) warming your feet by placing toe warmers inside your boots
 - b) burning a candle to make light
 - c) eating an apple for energy
 - d) plants using the sun's energy to produce sugars
 - e) a flashlight uses batteries to light your room at night
 - f) water flowing through the hydro dam creates electricity
 - g) your parent pushes your bicycle to get you going
 - h) ice melts because the freezer stays open too long
41. Create an equation to show what is the incoming energy and the outgoing energy for each of the following:
- a) a coffee maker
 - b) gasoline lawn mower
 - c) hairdryer
 - d) atom bomb
42. Name all 6 phase changes, and for each case, say what physical state it starts with, and what physical state it ends up with.
43. List all 3 phase changes that absorb energy.
44. List all 3 phase changes that release energy.
45. Why does a liquid drying on your skin make you cold?
46. State whether the following phase changes absorb or release energy:
- a) liquid water + energy \rightarrow water vapour
 - b) liquid water \rightarrow ice + energy
47. Write a formula to show whether energy is absorbed or released in the following dissolutions:
- a) Adding solid potassium hydroxide to water makes the temperature go up by 10°C as it dissolves.
 - b) Adding solid ammonium chloride to water makes the temperature drop by 5°C as it dissolves.
48. State whether the following are reversible or irreversible deformations:
- a) stretching an elastic (doesn't break)
 - b) stretching an elastic (breaks)
 - c) ripping paper
 - d) a tornado rips branches off a tree
 - e) you roll up a poster to store it
 - f) flattening play-doh

49. Label the following as either a physical or a chemical change:

- a) steel twisting due to heat b) a candle being lit c) ice melting d) salt dissolving in water
e) water vaporizing f) glass breaking g) iron rusting

50. Balance the following chemical equations:

- a) $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$ b) $\text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ c) $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

51. Which chemical equation absorbs energy? Which one releases energy?

- a) $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{CO}_2 + \text{heat}$ b) $\text{H}_2\text{O} + \text{electricity} \rightarrow \text{H}_2 + \text{O}_2$

52. What are the names of the four types of chemical reactions we studied?

53. For each of the four types of reactions, state whether energy is generally absorbed, released, or not needed.

54. What type of reaction is each of the following reactions:

- a) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$ b) $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl (ppt)} + \text{NaNO}_3$
c) $2\text{P}_2\text{O}_5 \rightarrow 4\text{P} + 5\text{O}_2$ d) $4\text{P} + 5\text{O}_2 \rightarrow 2\text{P}_2\text{O}_5$

55. What is a fluid?

56. Which of the following are fluids?

- a) fog b) water c) air d) corn starch e) powdered sugar f) hair gel g) smoke h) steam
i) sand j) ketchup

57. Explain, using the particle model, why fluids act the way they do.

58. What is the difference between a compressible and an incompressible fluid? Use the particle model to explain your answer.

59. What is a force? What is the unit of force?

60. What is pressure? What is the unit of pressure?

61. The bottom of a box measures 25 cm by 35 cm. What is the area in meters squared that touches the floor?

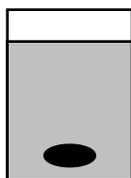
62. A 1500 kg boulder makes a 1.1m² area contact with the ground. Calculate the pressure the boulder exerts on the ground.

63. If force increases, pressure _____. If force decreases, pressure _____.

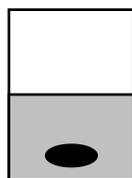
64. Why does a person wearing boots sink into snow while a person wearing skis or snowshoes doesn't sink?

65. If surface area increases, pressure _____. If surface area decreases, pressure _____.

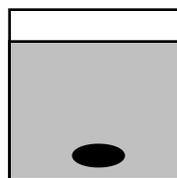
66. a) In which of these jars would the penny feel the most pressure? The least pressure? Are there any two jars that exert the same pressure?



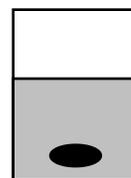
A



B



C



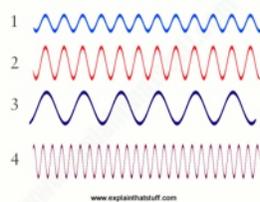
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b) Why do A and C feel the same pressure if there is more water in jar C?

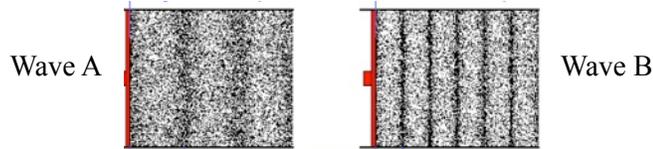
67. What are the names of the instruments which measure:

- a) the pressure underneath a fluid b) the distance you are under water c) the pressure inside the eye

68. In a compressible fluid, the pressure depends on the number of _____ with the sides of the container.
69. When you add more particles by putting more air into a compressed gas canister, what happens to the pressure inside?
70. What would happen to the pressure if you heat up the gas canister?
71. What would happen to the pressure if you cool down the gas canister?
72. What would happen to the pressure if your car accidentally backed up into the canister and crushed it to half the size it used to be?
73. What would happen to the size of a balloon if you increased the pressure by blowing more air into it?
74. What would happen to the size of a balloon if you increased the pressure by heating it up?
75. What would happen to the size of a balloon if you decreased the pressure by cooling it down?
76. Why don't you get crushed like a pancake by the pressure of all the air above pushing down on you?
77. Why do your ears get blocked when a plane takes off? What do you have to do to fix the problem?
78. What instrument is used to measure atmospheric pressure?
79. Pressure moves from an area of _____ pressure to an area of _____ pressure.
80. How does the second general principle of fluids explain why water comes out of a syringe faster when you push harder on the plunger?
81. A barber's chair and a car lift are examples of which general principle of fluids?
82. Why would a helium balloon float up, while a balloon filled with air sinks down, if they have the same mass?
83. Explain what happens to the pressure and volume of your lungs when you inhale (breathe in) and exhale (breathe out).
84. Decompression sickness, also known as "the bends", is a well-known condition among deep-sea divers. It is caused by gas bubbles developing in the blood when a diver ascends to the surface too quickly. The bubbles are formed by changes in pressure. Explain the relationship between the pressure and the volume of gas bubbles.
85. What does a wave transport?
86. What is the difference between how the energy and the particles move in transverse waves and in longitudinal waves?
87. What are the three characteristics properties of a wave? (things we can measure on a wave)
88. Draw and label all the parts of a wave (crest, trough, wavelength). Do this for a longitudinal and a transverse wave.
89. How do you measure the amplitude in a transverse wave? How about in a longitudinal wave?
90. What is the difference between a mechanical wave and an electromagnetic wave?
91. While standing on the edge of a beach, you count the waves that go by in three minutes and find that 14 waves moved by you during this time. What is the frequency of waves that hit the beach per hour?
92. Which of the following waves has the highest frequency? Which has the lowest frequency?



93. Which of the following waves has the highest frequency? Which has the lowest frequency?



94. Do electromagnetic waves need a medium to travel?

95. What type of wave is a sound wave? Does it need a medium to travel?

96. What type of movement causes sound waves to be created?

97. In what type of material does sound travel the fastest? The slowest?

98. What do sound waves do to your eardrums in order to allow us to hear? What do the compressions do? What do the rarefactions do?

99. What are the upper and lower limits of the sound frequencies that the human ear can hear?

100. What does the decibel scale represent?

101. How much louder is a sound that is 20 dB rather than 10 dB?

102. How much louder is a sound that is 40 dB rather than 10 dB?

103. What happens to you if you are constantly listening to sounds that are louder than 100 dB?

104. How does the frequency of a sound wave affect its pitch?

105. What is the instrument used to measure earthquake waves called?

106. Name at least two uses for each kind of waves in the electromagnetic spectrum (radio, microwaves, IR, visible, UV, x-rays, gamma-rays).

107. What are light waves?

108. In what direction do light waves travel?

109. What different things can happen to a light wave when it strikes an object?

110. What is reflection?

111. What would happen to your ability to see an object if it reflected none of the light that hit it?

112. Draw a sketch of the reflection of a ray of light off of an object. Make sure you label all parts with the following vocabulary words: incident ray, reflected ray, normal, angle of incidence, and angle of reflection.

113. What are the two rules that control the reflection of light?

114. What do you call a reflection that happens on a rough or uneven surface? What happens to the light rays in this case?

115. What do you call a reflection that happens on a perfectly smooth and polished surface, such as a mirror? What happens to the light rays in this case?

116. When an image reflects in a plane (flat) mirror:

- What is the position of the reflected image, in comparison to the position of the mirror?
- Is the image real or virtual?
- What is the size of the reflection in comparison to the real object?
- What type of inversion does the image have? What does that mean?

117. What are the two functions of plane mirrors?
118. What is refraction?
119. Why does refraction happen? What is altered when the light passes from one transparent medium to another?
120. What is the most common practical use for refraction?
121. What is a lens?
122. What are the two types of lenses?
123. What does a converging lens do to light rays?
124. What does a diverging lens do to light rays?
125. How can you tell the difference between a converging and a diverging lens when you look at their cross-section?
126. Label the parts of a lens. Make sure to include the following vocabulary words: surfaces of the lens, optical center, and principal axis.
127. In optics, what is a focal point for a converging lens?
128. In optics, what is the focal point for a diverging lens?
129. Why are there two focal points for a lens? What are the names of these two focal points?
130. Sketch what happens to parallel light rays as they pass through a converging lens.
131. Sketch what happens to parallel light rays as they pass through a diverging lens.
132. Where is the principal focal point in a converging lens? What about in a diverging lens? (i.e. Is it in front or behind the lens?)
133. Using the attached pictures of converging lenses (called 'lens practice sheet'), sketch where the image would be in each case. Make sure to mention if the image is larger, smaller or the same size as the object, whether it is real or virtual, and whether it is right-side up or inverted.
- a) the object is more than 2 focal point distances away from the lens ($> 2F'$)
 - b) the object is exactly at 2 focal points from the lens ($2F'$)
 - c) the object is between one focal point and two focal point distances from the lens ($2F' > \text{object} > F'$)
 - d) the object is at the (primary) focal point (F')
 - e) The object is between the lens and F' (the alternate focal point)
134. What is the only situation where an object's image is not inverted when using converging lenses?
135. Using the attached pictures of diverging lenses, sketch where the image would be in each case. Make sure to mention if the image is larger, smaller, or the same size as the object, whether it is real or virtual, and whether it is right-side up or inverted.
136. Is there ever a case where the image is inverted when looking through a diverging lens?
137. What kind of lenses are used to treat myopia (near-sightedness)? What about hyperopia (far-sightedness)?
138. What is a cell?
139. What are the three parts of a cell that are visible when you look through a microscope?
140. Name all the organelles of an animal cell, and list their function.

141. What is the difference between an animal and a plant cell? What organelles can you find in a plant that are not available in an animal cell?
142. What is DNA?
143. What is a genome?
144. What is a gene?
145. What is genetic diversity?
146. Why is genetic diversity important?
147. What is cell division?
148. What are the uses of cell division?
149. Are cells constantly dividing?
150. What is a chromosome?
151. What are the parts of a chromosome?
152. What are the steps of cell division (mitosis)?
153. What is the difference between a haploid and a diploid cell? What are each used for?
154. What is the difference between mitosis and meiosis?
155. What are the steps of meiosis?
156. What is the organization of cells in the body?
157. What is a tissue?
158. What is an organ?
159. What is a system?
160. What is an organism?
161. What are the four main types of tissues in the body? What are their main functions?
162. What are the organ systems, and their function?

That's it! If you can answer all these questions, you're in *very* good shape for the January exam.