Name: _____

_ 1) Which of the following changes is exothermic?
A) sublimation of iodine
B) vaporization of ethanol
C) freezing of water
D) melting of iron

___ 2) Which physical changes are endothermic?
A) condensation and deposition
B) melting and evaporating
C) condensation and sublimation
D) melting and freezing

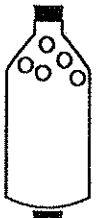
___ 3) Two samples of gold that have different temperatures are placed in contact with one another. Heat will flow spontaneously from a sample of gold at 60[redacted] to a sample of gold that has a temperature of [redacted]
A) 60[redacted] °C
B) 80[redacted] °C
C) 50[redacted] °C
D) 70[redacted] °C

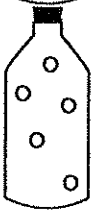
___ 4) As the temperature of a substance decreases, the average kinetic energy of its particles
A) decreases
B) remains the same
C) increases

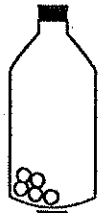
___ 5) At 1 atmosphere and 298 K, 1 mole of $H_2O(l)$ molecules and 1 mole of $C_2H_5OH(l)$ molecules *both* have the same
A) vapor pressure
B) average kinetic energy
C) density
D) mass

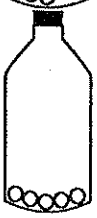
___ 6) Which kelvin temperature is equivalent to -24DC?
A) 297 K
B) 249 K
C) 273 K
D) 226 K

___ 7) Which diagram *best* represents a gas in a closed container?

A) 

B) 

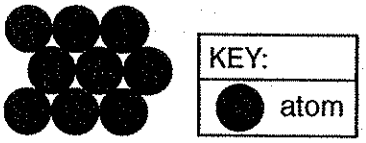
C) 

D) 

___ 8) Which grouping of the three phases of bromine is listed in order from left to right for increasing distance between bromine molecules?
A) solid, liquid, gas
B) solid, gas, liquid
C) gas, liquid, solid
D) liquid, solid, gas

___ 9) Which 5.0-milliliter sample of NH_3 will take the shape of and completely fill a closed 100.0-milliliter container?
A) $NH_3(aq)$
B) $NH_3(l)$
C) $NH_3(g)$
D) $NH_3(s)$

___ 10) Given the particle diagram:



At 101.3 kPa and 298 K, which element could this diagram represent?
A) Ag
B) Kr
C) Rn
D) Xe

___ 11) In which material are the particles arranged in a regular geometric pattern?
A) $CO_2(g)$
B) NaCl(aq)
C) $C_{12}H_{22}O_{11}(s)$
D) $H_2O(l)$

___ 12) In which equation does the term "heat" represent heat of fusion?
A) $H_2O(l) + HCl(g) \rightarrow H_3O^+(aq) + Cl^-(aq) + heat$
B) $H_2O(l) + heat \rightarrow H_2O(g)$
C) $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l) + heat$
D) $NaCl(s) + heat \rightarrow NaCl(l)$

___ 13) As ice melts at standard pressure, its temperature remains at 0 °C until it has completely melted. Its potential energy
A) remains the same
B) decreases
C) increases

___ 14) How much heat energy must be absorbed to completely melt 35.0 grams of $H_2O(s)$ at 0°C?
A) 79,100 J
B) 11,700 J
C) 146 J
D) 9.54 J

___ 15) What is the total number of joules released when a 5.00-gram sample of water changes from liquid to solid at 0 °C?

A) 11,300 J
B) 2,260 J
C) 334 J
D) 1,670 J

___ 16) What is the freezing point of bromine?

A) 539 °C
B) -7 °C
C) -539 °C
D) 7 °C

___ 17) In which process does a solid change directly into a vapor?

A) solidification
B) deposition
C) sublimation
D) condensation

___ 18) As the pressure on the surface of a liquid decreases, the temperature at which the liquid will boil

A) remains the same
B) increases
C) decreases

___ 19) The vapor pressure of a liquid is 0.92 atm at 60 °C The normal boiling point of the liquid could be

A) 45DC
B) 55DC
C) 65DC
D) 35DC

___ 20) As the temperature of a liquid increases, its vapor pressure

A) increases
B) remains the same
C) decreases

___ 21) Based on the *Vapor Pressure of Four Liquids* chemistry reference table, which substance has the *weakest* intermolecular forces?

A) ethanoic acid
B) propanone
C) water
D) ethanol

___ 22) According to *Vapor Pressure of Four Liquids* chemistry reference table, what is the vapor pressure of propanone at 45 °C ?

A) 98 kPa
B) 70. kPa
C) 33 kPa
D) 22 kPa

___ 23) Using your knowledge of chemistry and the information in the *Vapor Pressure of Four Liquids* chemistry reference table, which statement concerning propanone and water at 50 °C is true?

A) Propanone has a lower vapor pressure and weaker intermolecular forces than water.
B) Propanone has a higher vapor pressure and weaker intermolecular forces than water.
C) Propanone has a lower vapor pressure and stronger intermolecular forces than water.
D) Propanone has a higher vapor pressure and stronger intermolecular forces than water.

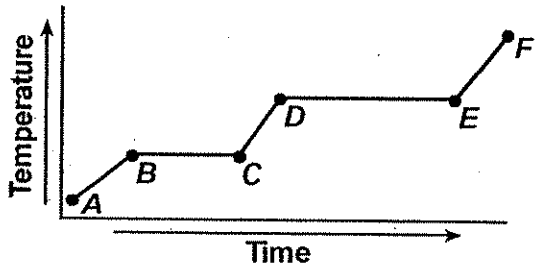
___ 24) Which phase change results in the release of energy?

A) $H_2O(l) \rightarrow H_2O(g)$
B) $H_2O(s) \rightarrow H_2O(g)$
C) $H_2O(g) \rightarrow H_2O(l)$
D) $H_2O(s) \rightarrow H_2O(l)$

___ 25) Which phase change is an exothermic process?

A) $NH_3(g)$ $NH_3(l)$
B) $Hg(l)$ $Hg(g)$
C) $CO_2(s)$ $CO_2(g)$
D) $Cu(s)$ $Cu(l)$

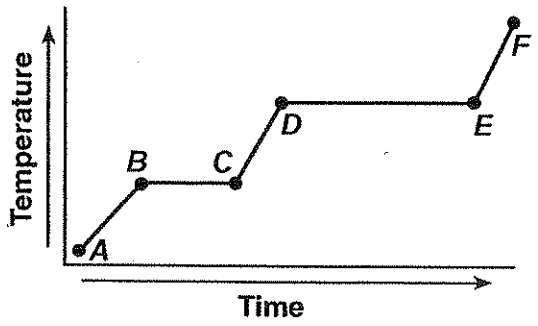
___ 26) The graph below represents the uniform heating of a substance, starting with the substance as a solid below its melting point.



Which line segment represents an increase in potential energy and *no* change in average kinetic energy?

A) *EF*
B) *CD*
C) *BC*
D) *AB*

___ 27) The graph below represents the uniform heating of a substance, starting below its melting point, when the substance is solid.



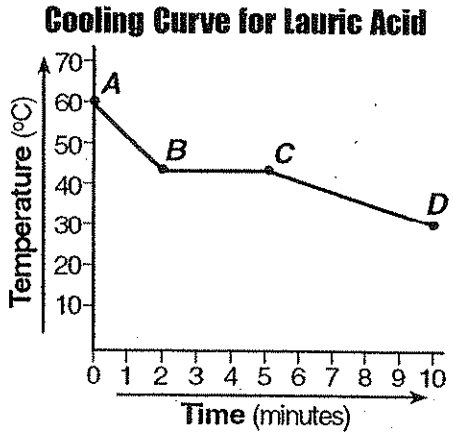
Which line segments represent an increase in average kinetic energy?

A) *DE* and *EF*
B) *BC* and *DE*
C) *AB* and *CD*
D) *AB* and *BC*

___ 28) Calculate the heat released when 25.0 grams of water freezes at 0 °C. [*Show all work. Record your answer with an appropriate unit.*]

___ 29) A liquid's boiling point is the temperature at which its vapor pressure is equal to the atmospheric pressure. Using the *Vapor Pressure of Four Liquids* chemistry reference table, what is the boiling point of propanone at an atmospheric pressure of 70 kPa?

___ 30) Given the graph below that represents the uniform cooling of a sample of lauric acid starting as a liquid above freezing point.



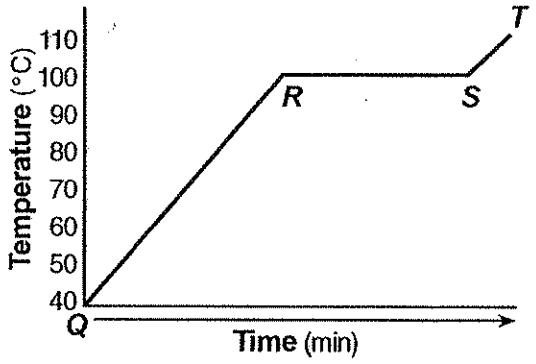
(a) Which line segment represents a phase change, only?

(b) What is the melting point of lauric acid?

(c) At which point do the particles of lauric acid have the *highest* average kinetic energy?

(d) Name the phase change that takes place during this 10-minute cooling time.

___ 31) A sample of water is heated from a liquid at 40.°C to a gas at 110DC. The graph of the heating curve is shown below.



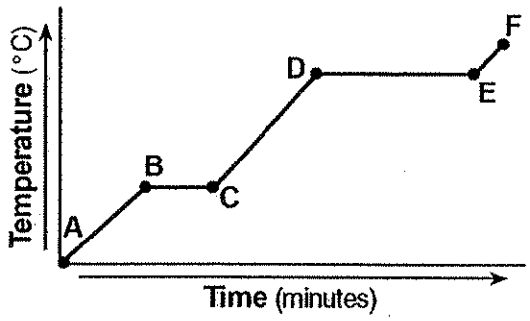
(a) On the heating curve diagram above, label each of the following regions:

Liquid, only
Gas, only
Phase change

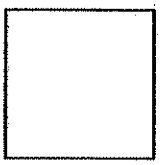
(b) For section *QR* of the graph, state what is happening to the water molecules as heat is added.

(c) For section *RS* of the graph, state what is happening to the water molecules as heat is added.

___ 32) Given the heating curve where substance *X* starts as a solid below its melting point and is heated uniformly:



Using (●) to represent particles of substance *X* in the given diagram, draw at *least* five particles as they would appear in the substance at point *F*. [*Use the box below.*]



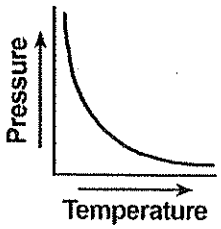
___ 33) The concept of an ideal gas is used to explain

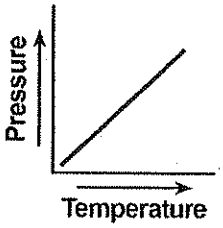
A) why some gases are diatomic
B) why some gases are monatomic
C) the behavior of a gas sample
D) the mass of a gas sample

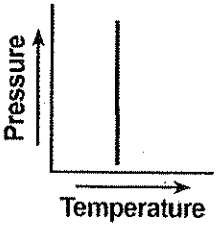
___ 34) The kinetic molecular theory assumes that the particles of an ideal gas

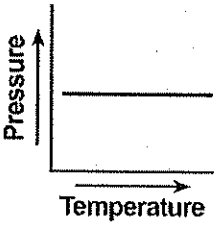
A) have collisions that result in the system losing energy
B) have strong attractive forces between them
C) are in random, constant, straight-line motion
D) are arranged in a regular geometric pattern

___ 35) Which graph shows the pressure-temperature relationship expected for an ideal gas?

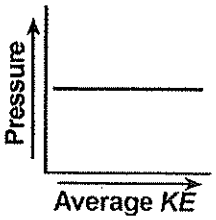
A) 

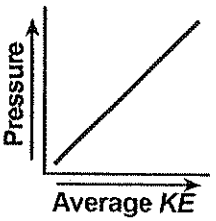
B) 

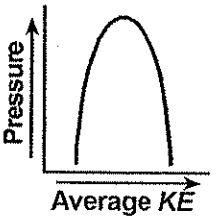
C) 

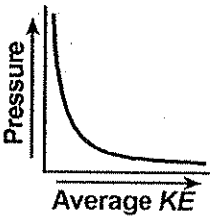
D) 

___ 36) Which graph *best* shows the relationship between the pressure of a gas and its average kinetic energy at constant volume?

A) 

B) 

C) 

D) 

___ 37) In a gaseous system at equilibrium with its surroundings, as molecules of $A(g)$ collide with molecules of $B(g)$ without reacting, the total energy of the gaseous system

A) remains the same
B) increases
C) decreases

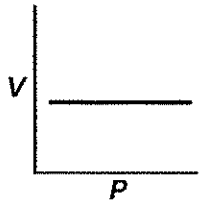
___ 38) A real gas behaves more like an ideal gas when the gas molecules are

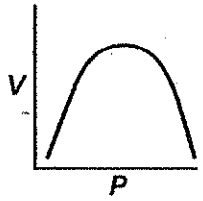
A) close and have strong attractive forces between them
B) far apart and have weak attractive forces between them
C) far apart and have strong attractive forces between them
D) close and have weak attractive forces between them

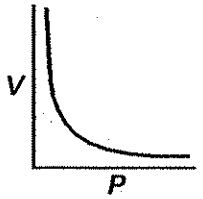
___ 39) Under which conditions of temperature and pressure would a sample of $H_2(g)$ behave *most* like an ideal gas?

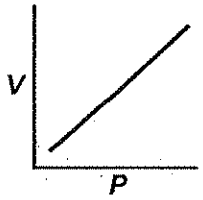
A) 0DC and 100 kPa
B) 150DC and 300 kPa
C) 150DC and 100 kPa
D) 0DC and 300 kPa

___ 40) Which graph *best* represents the pressure-volume relationship for an ideal gas at constant temperature?

A) 

B) 

C) 

D) 

___ 41) A gas occupies a volume of 40.0 milliliters at 20DC. If the volume is increased to 80.0 milliliters at constant pressure, the resulting temperature will be equal to

A) $293\ K \times \frac{40.0\ mL}{80.0\ mL}$
B) $293\ K \times \frac{80.0\ mL}{40.0\ mL}$
C) $20DC \times \frac{40.0\ mL}{80.0\ mL}$
D) $20DC \times \frac{80.0\ mL}{40.0\ mL}$

___ 42) The volume of a gas is 4.00 liters at 293 K and constant pressure. For the volume of the gas to become 3.00 liters, the Kelvin temperature must be equal to

A) $\frac{3.00 \times 293}{4.00}$
B) $\frac{293}{3.00 \times 4.00}$
C) $\frac{3.00 \times 4.00}{293}$
D) $\frac{4.00 \times 293}{3.00}$

___ 43) The temperature of a 2.0-liter sample of helium gas at STP is increased to 27DC and the pressure is decreased to 80. kPa. What is the new volume of the helium sample?

A) 4.0 L
B) 2.0 L
C) 1.4 L
D) 2.8 L

___ 44) A sample of helium gas has a volume of 900. milliliters and a pressure of 2.50 atm at 298 K. What is the new pressure when the temperature is changed to 336 K and the volume is decreased to 450. milliliters?

A) 5.64 atm
B) 14.1 atm
C) 0.177 atm
D) 4.43 atm

___ 45) A gas occupies a volume of 444 mL at 273 K and 79.0 kPa. What is the final kelvin temperature when the volume of the gas is changed to 1,880 mL and the pressure is changed to 38.7 kPa?

A) 2,360 K
B) 292 K
C) 31.5 K
D) 566 K

___ 46) At the same temperature and pressure, 1.0 liter of $CO(g)$ and 1.0 liter of $CO_2(g)$ have

A) equal masses and the same number of molecules
B) equal volumes and the same number of molecules
C) different volumes and a different number of molecules
D) different masses and a different number of molecules

___ 47) A sample of oxygen gas is sealed in container *X*. A sample of hydrogen gas is sealed in container *Z*. Both samples have the same volume, temperature, and pressure. Which statement is true?

A) Containers *X* and *Z* both contain the same mass of gas.
B) Container *X* contains fewer gas molecules than container *Z*.
C) Container *X* contains more gas molecules than container *Z*.
D) Containers *X* and *Z* both contain the same number of gas molecules.

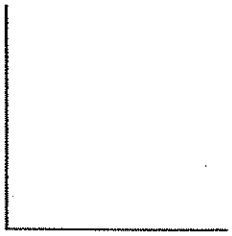
___ 48) At STP, 4 liters of O_2 contains the same total number of molecules as

A) 2 L of Cl_2
B) 8 L of He
C) 4 L of CO_2
D) 1 L of NH_3

Questions 49 and 50 refer to the following:

The diagram below shows a piston confining a gas in a cylinder.

___ 49) Using the set of axes below, sketch the general relationship between the pressure and the volume of an ideal gas at constant temperature.



___ 50) The gas volume in the cylinder is 6.2 milliliters and its pressure is 1.4 atmospheres. The piston is then pushed in until the gas volume is 3.1 milliliters while the temperature remains constant. Calculate the pressure, in atmospheres, after the change in volume. [*Show all work.*]

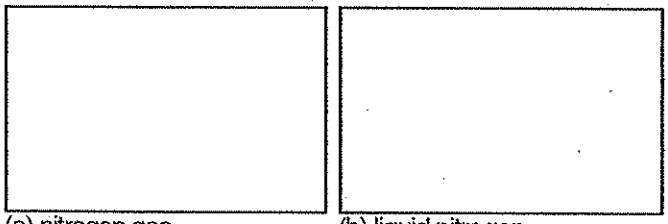
___ 51) A weather balloon has a volume of 52.5 liters at a temperature of 295 K. The balloon is released and rises to an altitude where the temperature is 252 K.

The original pressure of the given weather balloon at 295 K was 100.8 kPa and the pressure at the higher altitude at 252 K is 45.6 kPa. Assume the balloon does not burst. Show a correct numerical setup for calculating the volume of the balloon at the higher altitude.

___ 52) A sample of oxygen gas in one container has a volume of 20.0 milliliters at 297 K and 101.3 kPa. The entire sample is transferred to another container where the temperature is 283 K and the pressure is 94.6 kPa.

Show a correct numerical setup for calculating the new volume of this sample of oxygen gas.

___ 53) The diagram  represents one molecule of nitrogen.



(a) In the box labeled *(a)* above, draw a particle model that shows *at least* six molecules of nitrogen gas.

(b) In the box labeled *(b)* above, draw a particle model that shows *at least* six molecules of liquid nitrogen.

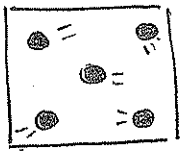
(c) Describe, in terms of particle arrangement, the difference between nitrogen gas and liquid nitrogen.

(d) Good models should reflect the true nature of the concept being represented. What is a limitation of two-dimensional models?

REGENTS CHEMISTRY PBOM Practice Test Name KEY

Version ____ Period ____

1. C
2. B
3. C
4. A
5. B
6. B
7. B
8. A
9. C
10. A
11. C
12. D
13. C
14. B
15. D
16. B
17. C
18. C
19. C
20. A
21. B
22. B
23. B
24. C
25. A
26. C

27. C
28. 8,350 J
29. 45°C
30. a.) BC b.) 42-43°C c.) A d.) Freezing
31. a.) $\overline{QR}$ = (1), $\overline{ST}$ = (g), $\overline{RS}$ = phase ch. b.) moving FASTER c.) moving FARTHER
32. ____ 
33. C
34. C
35. B
36. B
37. A
38. B
39. C
40. C
41. B
42. A
43. D
44. A
45. D
46. B
47. D
48. C
49. ____ 

50. 2.8 atm

51. $\frac{(100.8)(52.5)}{(295)} = \frac{(45.6)(V_2)}{(252)}$

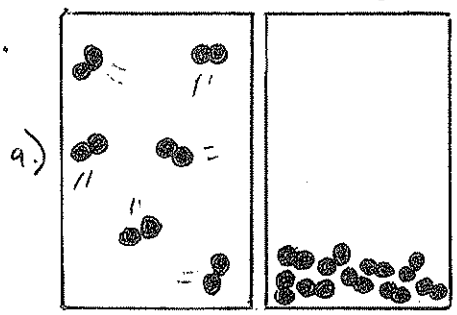
or

$V_2 = \frac{(100.8)(52.5)(252)}{(295)(45.6)}$

52. $\frac{(101.3)(20.0)}{(297)} = \frac{(94.6)(V_2)}{(283)}$

or

$V_2 = \frac{(101.3)(20.0)(283)}{(297)(94.6)}$

53. 

c.) Gas particles farther apart

d.) 2-D doesn't show movement in all directions/planes