Biology Questions (1 – 20)

1. The three most common atoms in your body are ____.
   A) carbon, oxygen, and sulfur
   B) hydrogen, oxygen, and carbon
   C) carbon, nitrogen, and oxygen
   D) nitrogen, hydrogen, and oxygen
   E) carbon, hydrogen, and nitrogen

2. Which of the following contain enzymes and are the main organelles of digestion within cells?
   A) Golgi bodies
   B) ribosomes
   C) mitochondria
   D) lysosomes
   E) endoplasmic reticulum

3. The light-dependent reactions of photosynthesis ____.
   A) involve photolysis of water
   B) occur in mitochondria
   C) fix carbon dioxide
   D) occur in the outer chloroplast membrane
   E) involve the capture of light energy but not electron transport chains

4. Major reshuffling of genes occurs during ____.
   A) anaphase of meiosis I
   B) anaphase of meiosis II
   C) prophase of meiosis I
   D) prophase of meiosis II
   E) mitosis

5. Which of the following describes what most people believed in Mendel's time?
   A) All genetic traits breed true.
   B) Only certain forms of domesticated plants and animals breed true.
   C) The characteristics of parents are blended in the offspring.
   D) Acquired characteristics are inherited.
   E) The inheritance of traits is controlled by the blood.

6. DNA from bacteria differs from DNA in humans in which of the following ways?
   A) base composition
   B) sugar-phosphate linkage
   C) nucleotide sequence
   D) bonding of the helix
   E) All of the above

7. Which of the following is true of bacteria?
   A) They are diploid organisms.
   B) They have circular DNA molecules.
   C) They produce gametes.
   D) They are eukaryotic.
   E) All of the above

8. The classification of fungi is based on their ____.
   A) biochemistry
   B) method of obtaining nutrients
   C) morphology
   D) method of locomotion
   E) method of sexual reproduction

9. Which of the following would not be associated with vascular plants?
   A) root systems
   B) shoot systems
   C) angiosperms
   D) gymnosperms
   E) bryophytes

10. The plant tissue that carries out photosynthesis and stores materials is ____.
    A) vascular cambium
    B) collenchyma
    C) sclerenchyma
    D) parenchyma
    E) pericycle

11. Which of the following elements required by plants is NOT obtained directly from the soil?
    A) nitrogen
    B) hydrogen
    C) carbon
    D) iron
    E) sulfur

12. Which of the following is the male reproductive part of a flower?
    A) carpel
    B) sepal
    C) petal
    D) stamen
    E) receptacle

13. In humans and other animals, which germ layer produces the nervous system?
    A) ectoderm
    B) endoderm
    C) gastroderm
    D) mesoderm
    E) all of the germ layers

14. Vegetarians need to choose the foods they eat carefully to get the necessary _____.
    A) vitamins
    B) minerals
    C) amino acids
    D) carbohydrates
    E) fatty acids

15. Most of the oxygen in human blood is carried by _____.
    A) plasma
    B) serum
    C) platelets
    D) hemoglobin
    E) iron

16. The simplest nerve pathway _____.
    A) is located in the midbrain
    B) is the reflex arc
    C) is located in the brainstem
    D) is located in the autonomic nervous system
    E) is in the peripheral nervous system

17. The gas that makes up most of the air we breath is _____.
    A) oxygen
    B) water vapor
    C) nitrogen
    D) carbon dioxide
    E) carbon monoxide

18. The first disease for which a vaccine was developed was _____.
    A) the plague
    B) smallpox
    C) rabies
    D) anthrax
    E) diphtheria

19. Which of the following types of mutations are NOT subject to natural selection?
    A) lethal
    B) physiological
    C) morphological
    D) beneficial
    E) neutral

20. By definition, which of the following is NOT a part of a community?
    A) bacteria
    B) populations
    C) animals
    D) soil
    E) plants

Chemistry Questions (21 – 40)

21. All of the following are examples of physical changes, except for _____.
    A) the burning of a match
    B) the boiling of mercury
    C) diluting a salt solution
    D) the breaking of a pencil
    E) melting ice

22. The molar heat of fusion of water is 6.02 kJ/mol. Calculate the energy required to melt 14.0 g of water.
    A) 4.68 kJ
    B) 7.74 kJ
    C) 6.02 kJ
    D) 84.3 kJ
    E) 9.02 kJ

23. The symbols Fe, Hg, N, Au, and Ne refer to the following elements:
    A) fluorine, hydrogen, nitrogen, gold, neon
    B) iron, mercury, nitrogen, silver, neon
    C) iron, mercury, nitrogen, gold, neon
    D) fluorine, mercury, nickel, silver, neon
    E) iron, hydrogen, nickel, gold, nitrogen

24. An analysis of a compound showed it contained 87.4% nitrogen and 12.6% hydrogen, by weight. The molecular weight was determined to be 32.05 g/mol. What is the molecular formula for this compound?
    A) N_2H_4
    B) NH_2
    C) NH_3
    D) cannot be determined from the information given
    E) N_2H_2

25. Balance the equation ? ZnO + ? HCl → ? $ZnCl_2$ + ? H_2O, using the smallest possible integers. The coefficient of HCl is ____.
    A) 4
    B) 0.5
    C) 3
    D) 2
    E) 1

26. Predict the products when you mix silver nitrate(s) and potassium chloride(s) with enough water to dissolve both.
    A) $KNO_3(aq)$, $AgCl(aq)$
    B) $KAg(aq)$, $NO_3Cl(aq)$
    C) $ClNO_3(aq)$, $K_2O(aq)$
    D) $KNO_3(s)$, $AgCl(aq)$
    E) $KNO_3(aq)$, $AgCl(s)$

27. Give the name and symbol for the element which has mass number 64 and 35 neutrons.
    A) $_{35}^{64}Cu$
    B) $_{64}^{29}Gd$
    C) $_{29}^{35}Br$
    D) $_{29}^{64}Cu$
    E) $_{64}^{99}Gd$

28. In a given atom, what is the largest possible number of 3p electrons?
    A) 10
    B) 18
    C) 6
    D) 5
    E) 2

29. A neutral isolated atom has the ground state configuration: $1s^2\, 2s^2\, 2p^6\, 3s^2\, 3p^3$ in its ground state. Identify the element.
    A) cobalt
    B) Cannot be answered without more information.
    C) argon
    D) phosphorus
    E) vanadium

30. Which of the following molecules contains both covalent and ionic bonding?
    A) KF
    B) CH_4
    C) $NaNO_3$
    D) CO_2
    E) C_2F_4

31. Given that the distance between bases on a baseball diamond (a perfect square) is 90 feet and the pitchers mound is one-half the distance between home and second base. If the pitcher throws a curve ball at 95 miles per hour, how many seconds will it take for the ball to reach home plate?
    A) 1.0 sec
    B) 0.5 sec
    C) 0.2 sec
    D) 0.1 sec
    E) 0.05 sec

32. The heat of fusion of a metal is 6.816 joules/gram at its freezing point of 369.0°F. How many kilojoules of energy are required to melt 637.4 grams of this metal ?
    A) 9.6 kj
    B) 4.3 kj
    C) 7.8 kj
    D) 1.7 kj
    E) 3.0 kj

33. How many moles of hydrogen are present in a 13.36 liter container at a pressure of 914. torr at 91.8°C. ?
    A) 0.375 mol
    B) 0.965 mol
    C) 0.536 mol
    D) 0.751 mol
    E) 1.180 mol

34. How many hydrogen nuclei in 0.1673 moles of H_2SO_4 ?
    A) 1.612×10^{22}
    B) 3.022×10^{22}
    C) 3.022×10^{24}
    D) 8.058×10^{22}
    E) 2.015×10^{23}

35. What is the % carbon, by weight, in 1.973 grams of potassium carbonate?
    A) 3.5 %
    B) 6.1 %
    C) 8.7 %
    D) 15.6 %
    E) 19.1 %

36. For the reaction ? $FeCl_2$ + ? Na_3PO_4 → ? $Fe_3(PO_4)_2$ + ? $NaCl$, a maximum of ____ grams of $Fe_3(PO_4)_2$ could be formed from 8.181 grams of $FeCl_2$ and 6.140 grams of Na_3PO_4.
    A) 8.0 g
    B) 7.7 g
    C) 7.3 g
    D) 7.0 g
    E) 6.7 g

37. What is the molar concentration of ammonia in a solution in which there are 0.1792 grams of ammonia per 262 milliliters of solution?
    A) 0.09 M
    B) 0.08 M
    C) 0.06 M
    D) 0.04 M
    E) 0.03 M

38. The freezing point depression constant of water is 1.86°C/m. What is the expected freezing point of a sodium chloride solution made from 0.125 moles of sodium chloride and 2.0 liters of water?
    A) –0.37°C
    B) –0.23°C
    C) –0.65°C
    D) –2.05°C
    E) –1.67°C

39. Suppose you add 7.88×10^{-3} moles of HNO_3 to enough water to make 761.35 milliliters of solution. What is the pH of the solution?
    A) 1.99
    B) 2.78
    C) 3.57
    D) 1.39
    E) 4.37

40. The half-life of ^{137}Ce is 30 years. How many g of ^{137}Ce must be produced now to have a sample containing 49 g of ^{137}Ce 177 years from now?
    A) 3000 g
    B) 2000 g
    C) 6500 g
    D) 1200 g
    E) 5000 g

Physics Questions (41 – 60)

41. What type of force causes a car to go around level curve?
    A) A centripetal force
    B) A centrifugal force
    C) A normal force
    D) A static frictional force
    E) A kinetic frictional force

42. Bernoulli's equation is an expression of
    A) conservation of mass.
    B) conservation of energy.
    C) conservation of linear momentum.
    D) conservation of angular momentum.
    E) conservation of charge.

43. A brass ring with an inner diameter of 2.750 cm needs to be placed over an aluminum rod with a diameter of 2.775 cm. Given that the coefficients of linear thermal expansion of brass and aluminum are 19.0×10^{-6} $(C°)^{-1}$ and 25.0×10^{-6} $(C°)^{-1}$ respectively and if both of these dimensions have been measured at 15.0 °C to what final temperature does the ring need to be brought to in order to exactly fit over the rod?
    A) 360 °C
    B) 375 °C
    C) 463 °C
    D) 478 °C
    E) 493 °C

44. A pendulum is made from a string of negligible mass with length 1.75 m and a bob with a non-negligible mass, M. If the pendulum bob is released from rest at an angle of 16.3° with respect to the vertical, then what is the maximum speed of the bob? Neglect both friction and air resistance in this problem.
    A) 1.17 m/s
    B) 3.96 m/s
    C) 4.97 m/s
    D) 5.74 m/s
    E) 9.80 m/s

45. If the intensity level at a given location from one source of sound is 55.0 dB and the intensity level from another independent source of sound is 57.5 dB then what is the combined intensity level from both sources neglecting interference effects.
    A) 53.9 dB
    B) 59.4 dB
    C) 63.3 dB
    D) 113 dB
    E) This problem can't be solved with the given data.

46. How many significant digits should be correctly reported in the solution to the following calculation?

    (5.26893 - 5.26854)/1.47828
    A) 2
    B) 3
    C) 4
    D) 5
    E) 6

47. A turntable (a rotating platform that carries a phonograph record – a analogue sound storage medium usually made of polyvinyl chloride (PVC)) comes to rest after rotating through 41.66 revolutions in 2.500 minutes. What was the initial angular velocity of the turntable if the angular acceleration was uniform?
    A) 16.67 rpm
    B) 33.33 rpm
    C) 45.00 rpm
    D) 66.67 rpm
    E) 78.00 rpm

48. If you double the amplitude of the oscillation of a simple pendulum then by what factor does the frequency change?
    A) 1/4
    B) 1/2
    C) 1
    D) 2
    E) 4

49. A train on a straight level track has a final speed 65.0 km/h. A uniform acceleration with a magnitude of 1.25 m/s^2 was applied while the train slowed down over a distance of 255 m. What was the speed of the train at the beginning of this distance?
    A) 17.6 m/s
    B) 31.0 m/s
    C) 59.9 m/s
    D) 69.7 m/s
    E) This problem can't be solved with the given data.

50. Whose work is usually cited as experimental evidence of the particle nature of light (photon)?
    A) Bohr
    B) Compton
    C) Dirac
    D) Rutherford
    E) Schrödinger

51. A 1500 kg car accelerates uniformly from 60.0 km/hr to 90.0 km/hr in 6.00 s along a level stretch of road. If the combined resistive forces acting on the car due to both friction and air resistance have an average value of 575 N during the acceleration period, then what is the average power required of the car?
    A) 11.1 kW
    B) 31.4 kW
    C) 55.4 kW
    D) 111 kW
    E) 606 kW

52. Four equal 10.0 kg masses are placed at the corners of a square with side length 5.00 cm. Only considering the gravitational interactions between the masses themselves, what is the magnitude of the net gravitational force acting on one of the masses due to the other three? Given that $G = 6.67 \times 10^{-11}$ Nm²/kg².

A) 2.83×10^{-7} N
B) 3.61×10^{-7} N
C) 5.11×10^{-6} N
D) 6.67×10^{-6} N
E) 8.00×10^{-6} N

53. Steel has a bulk modulus of 140 GPa. If a steel sphere 50.0 cm in diameter at STP were to have its pressure increased to 90.0 atm (roughly the surface pressure on Venus) then what is the strain? Given that 1 atm = 101.3 kPa.

A) -6.51×10^{-2}
B) -6.44×10^{-5}
C) -6.36×10^{-10}
D) $+6.43 \times 10^{-10}$
E) $+6.51 \times 10^{-5}$

54. For a non-relativistic elastic collision, which of the following conservation principles apply:

I. Conservation of Kinetic Energy

II. Conservation of Linear Momentum

III. Conservation of Angular Momentum

A) I
B) I & II
C) II
D) II & III
E) I, II & III

55. In describing the photoelectric effect, the classical theory predicts that:

A) the photocurrent increases with an increase in the incident light intensity.
B) the maximum kinetic energy depends upon the frequency of the incident light.
C) there is no photocurrent if the frequency of the incident light is below a certain value.
D) the photocurrent is always observed immediately, independent of the frequency of the incident light.
E) two of the above options are true.

56. In 1921, President Warren G. Harding presented Marie Curie 1.00 gram of Radium-226 on behalf of the women of America in recognition of her service to science. If the half-life of Radium-226 is 1.60×10^3 yr then how much of the original Radium-226 in her gift is left now in 2008?

A) Effectively none.
B) 37.0 mg
C) 889 mg
D) 963 mg
E) Effectively all of it.

57. What is the wavelength in air of the radio station AM 1300 kHz – THE ZONE. Note: you may use $n_{air} = 1.000$.

A) 0.231 m
B) 2.31 m
C) 23.1 m
D) 231 m
E) 2.31×10^5 m

58. Rescue supplies are being delivered by plane to a designated drop point. The plane will approach the drop point horizontally at a constant 225 km/hr and will release the supplies at 278 m above and 485 m in front of the drop point. What is the required vertical component of the supplies velocity in order to exactly hit the drop point?

A) 2.20 m/s, up
B) 0 m/s
C) 40.7 m/s, down
D) 118 m/s, down
E) 218 m/s, down

59. At a point in space there is an electric field vector due to a first charge that has a magnitude of 4.25 N/C and points at 35.7° west of north a second electric field vector due to another charge has a magnitude of 6.81 N/C and points 10.3° south of west. What is the magnitude and direction of the net electric field at this point?

A) 9.45 N/C at 13.7° west of north
B) 9.45 N/C at 76.3° west of north
C) 10.2 N/C at 7.08° west of north
D) 10.2 N/C at 82.9° west of north
E) This problem can't be solved with the given data.

60. Two boxes, with masses 12.5 kg and 25.5 kg, are connected by a taut string on a surface that is inclined at 25° with respect to the horizontal. If the coefficients of kinetic friction between the boxes and the table are 0.100 and 0.150 respectively and the 25.5 kg box is placed below the 12.5 kg box on the incline, what is the magnitude of the acceleration of the 25.5 kg box just after they have begun to move down the incline?

    A) 2.81 m/s^2
    B) 2.96 m/s^2
    C) 3.25 m/s^2
    D) 4.14 m/s^2
    E) 8.33 m/s^2

Periodic Table of the Elements

1A																	8A
1 H 1.008	2A											3A	4A	5A	6A	7A	2 He 4.003
3 Li 6.941	4 Be 9.012						8B					5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 23.00	12 Mg 24.31	3B	4B	5B	6B	7B		1B	2B			13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)		109 Une (267)									

	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
Lanthanides														
Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

OTHER USEFUL INFORMATION

Acceleration of gravity at Earth's surface, $g = 9.81 \ m/s^2$

Avogadro's Number, $N = 6.02 \times 10^{23}$ molecules/mole

Planck's constant, $h = 6.63 \times 10^{-34} \ J \cdot s$

Planck's reduced constant, $\hbar = {}^h/_{2\pi} = 1.05 \times 10^{-34} \ J \cdot s$

Standard temperature and pressure (STP) is $0°C$ and 1 atmosphere

Gram molecular volume at STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^8 \ m/sec$

Absolute zero = 0 K = $-273.15°C$

Gas constant, $R = 1.986 \ cal/K \cdot mole = 0.082 \ liter \cdot atm/K \cdot mole$

One Faraday = 96,500 coulombs $(9.65 \times 10^4 \ C)$

Dulong and Petit's constant = $6.0 \ amu \cdot cal/gram \cdot K$

Electron rest mass, $m_e = 9.11 \times 10^{-31} \ kg$

Atomic mass unit, $m_a = 1.66 \times 10^{-27} \ kg$

Boltzmann constant, $k_B = 1.38 \times 10^{-23} \ J/K$

Permittivity of free space $\varepsilon_0 = 8.85 \times 10^{-12} \ C^2/N \cdot m^2$

Permeability of free space $\mu_0 = 4\pi \times 10^{-7} \ T \cdot m/A$

1 Atmosphere = $1.02 \times 10^5 \ N/m^2$ = 760 Torr = 760 mmHg

1 Electron Volt = 1.6×10^{-19} Joules

Charge of an electron = -1.6×10^{-19} coulombs (C)

1 horsepower (hp) = 746 W = 550 ft·lb/s

Neutron Mass = 1.008665 au

Proton Mass = 1.007277 au

1 au = 931.5 MeV

1 calorie = 4.184 Joules (J)

Specific heat of water = $4.18 \ J/g \cdot °C$

UIL HIGH SCHOOL SCIENCE CONTEST
ANSWER KEY

INVITATIONAL A • 2008

1.	B	21.	A	41.	D
2.	D	22.	A	42.	B
3.	A	23.	C	43.	E
4.	C	24.	A	44.	A
5.	C	25.	D	45.	B
6.	C	26.	E	46.	A
7.	B	27.	D	47.	B
8.	E	28.	C	48.	C
9.	E	29.	D	49.	B
10.	D	30.	C	50.	B
11.	C	31.	B	51.	C
12.	D	32.	B	52.	C
13.	A	33.	C	53.	B
14.	C	34.	E	54.	E
15.	D	35.	C	55.	A
16.	B	36.	E	56.	D
17.	C	37.	D	57.	D
18.	B	38.	B	58.	A
19.	E	39.	A	59.	B
20.	D	40.	A	60.	A

41. (D) For rolling motion the force between the tires and the ground is a static frictional force that will point in towards the center of the circle in this case. Note: centripetal is a direction not a type of force.

42. (B) Bernoulli's equation is an expression of conservation of energy.

43. (E) The change in temperature = (change in length)/[(thermal coefficient)(original length)], thus $T = (0.025)/[(19 \times 10^{-6})(2.750)] + 15 = 493$ °C.

44. (A) By conservation of mechanical energy we have: $M(9.8)[1.75(1-\cos(16.3°)] = \frac{1}{2} M v^2$, which solves as $v = 1.17$ m/s (it is a maximum at the bottom of the arc).

45. (B) The intensities add not the intensity levels, so the total intensity level $I = I_o (10^{5.50} + 10^{5.75})$ which gives $\beta = 10 \log\{[I_o (10^{5.50} + 10^{5.75})]/[I_o]\} = 59.4$ dB and I_o is not needed.

46. (A) After the subtraction there are only 2 significant digits, so the final answer should only have two significant digits in it.

47. (B) The angular acceleration is $\alpha = -\omega_0/2.5$ and thus $41.66 = 0 + \omega_0(2.5) + \frac{1}{2} (-\omega_0/2.5)(2.5)^2$ which gives $\omega_0 = 2(41.66)/2.5 = 33.33$ rpm.

48. (C) The frequency of a simple pendulum is independent of the amplitude.

49. (B) In physics acceleration is a general term and in this case it must be that the train is decreasing the magnitude of the initial velocity, which can be found from: $v_0^2 = v^2 - 2a(x-x_0)$ with a<0 in order to give $v_0 = 31.04$ m/s. Note: if a>0 no real solution is obtained.

50. (B) The Compton effect is usually presented as evidence of the photon theory of light.

51. (C) The forward force is given by: $F = (1500)(25 - 16.667)/6 + 575 = 2658$ N. Thus the average power is given by: $P_{avg} = (2658)(25 + 16.667)/2 = 55.4$ kW.

52. (C) The force along the sides is 2.67×10^{-6} N and the force along the diagonal is 1.33×10^{-6} N due to the longer distance. Thus the magnitude of the net force is $2^{1/2}(2.67 \times 10^{-6}) + 1.33 \times 10^{-6} = 5.11 \times 10^{-6}$ N.

53. (B) The strain = -(stress)/(modulus) = $-(90-1)(1.013 \times 10^5)/(140 \times 10^9) = -6.44 \times 10^{-5}$

54. (E) In an elastic collision, kinetic energy and momentum are conserved. Both linear and angular momenta are conserved in the collision, what we write down depends upon the particular situation.

55. (A) The classical theory predicts that the photocurrent increases with an increase in the intensity of the incident light.

56. (D) The amount = (initial amount) e^-[(decay const)(time)] = (1) e^-[{ln(2)/(1.60 \times 10^3)}(2008-1921)] = 963 mg.

57. (D) The wavelength is found by $(3 \times 10^8)/(1300 \times 10^3) = 231$ m.

58. (A) The time is found from the horizontal component equations by $t = 485/62.5 = 7.76$ s. This allows you to solve for the y-component of the initial velocity as follows: $0 = (+278) + v_{oy} (7.76) + \frac{1}{2} (-9.8)(7.76)^2$, which gives $v_{oy} = 2.20$ m/s, up.

59. (B) By components: $\sum E_x = -4.25 \sin(35.7°) -6.81 \cos(10.3°) = -9.18$ and $\sum E_y = +4.25 \cos(35.7°) -6.81 \sin(10.3°) = +2.23$ thus the magnitude is $[(-9.18)^2+(2.23)^2]^{1/2} = 9.45$ N/C and the angle is $\tan^{-1}(-9.18/2.23) = 76.3°$ west of north.

60. (A) Since the top block accelerates faster than the bottom block then the string will go slack and they will move/accelerate independently until they contact one another. So just after they begin to move the acceleration of the bottom block is $a = 9.8 [\sin(25°) - 0.15 \cos(25°)] = 2.81$ m/s^2.