

1. Which of the following organisms are not eukaryotic:
 - A) protists
 - B) eubacteria
 - C) fungi
 - D) plants
 - E) animals
2. Protection from phagocytosis is mediated by:
 - A) capsule
 - B) cell wall
 - C) membrane
 - D) nucleoid
 - E) plasmid
3. Cyanobacterial cell contains:
 - A) cell wall
 - B) carboxysomes
 - C) thylakoids
 - D) cyanophycin
 - E) everything is correct
4. Which of the following proteins are not a part of cytoskeleton:
 - A) actin fibers
 - B) intermediate filaments
 - C) microtubules
 - D) macrotubules
 - E) none is correct
5. Fluid mosaic model was developed by:
 - A) Hooke
 - B) Schleiden
 - C) Schwann
 - D) Linne
 - E) Singer and Nicolson
6. Which of the following molecule can be classified in a group of small uncharged polar molecules?
 - A) benzene
 - B) Na⁺
 - C) glucose
 - D) ethanol
 - E) O₂

7. Find the correct statement related to endocytosis:
- A) it is an active process
 - B) it uses membrane vesicles for molecular transport
 - C) it spends ATP
 - D) it is used for entry of pathogens
 - E) everything is correct
8. mRNA synthesis takes place in:
- A) nucleus
 - B) nucleolus
 - C) endoplasmic reticulum
 - D) Golgi apparatus
 - E) mitochondria
9. Polysaccharide synthesis takes place in:
- A) Golgi apparatus
 - B) mitochondria
 - C) centrioles
 - D) endoplasmic reticulum
 - E) lysosomes
10. Mitochondrion:
- A) is a single-membrane bound organelle
 - B) store Mg^{2+} for cell signaling
 - C) mediate cell death
 - D) has dependent genome and proteome
 - E) cannot be visualized with light microscope
11. Sucrose is a:
- A) monosaccharide
 - B) simple sugar
 - C) disaccharide
 - D) polysaccharide
 - E) nucleotide
12. Total body water volume is approximately:
- A) 40L
 - B) 25L
 - C) 15L
 - D) 12L
 - E) 3L

13. Protein structure on chromatids where the spindle fibers attach during cell division to pull sister chromatids apart is called:
- A) centromere
 - B) kinetochore
 - C) centrosome
 - D) actin–myosin contractile ring
 - E) crossing over
14. Human somatic cells consist of:
- A) 23 pairs of homologous chromosomes
 - B) 22 pairs of autosomes
 - C) 1 pair of sex-chromosomes
 - D) 46 chromosomes
 - E) everything is correct
15. Find the F₂ generation genotypic ratio in Mendelian monohybrid cross with incomplete dominance:
- A) 3:1
 - B) 1:1
 - C) 9:3:3:1
 - D) 1:2
 - E) 1:2:1
16. Which of the following is not a test cross?
- A) aabb x AaBb
 - B) bb x Bb
 - C) DdEe x DDEE
 - D) Dd x dd
 - E) ffgg x FfGg
17. Which of the following genotypes is homozygous for one trait, and heterozygous for another trait?
- A) Bb
 - B) Aabb
 - C) AAbb
 - D) AaBb
 - E) Aa
18. Find the karyotype typical for aneuploidy:
- A) 46,XX
 - B) 23,X
 - C) 69,XXX
 - D) 45,X
 - E) 92,XXXX

19. RNA polymerase is a main:
- A) replication enzyme
 - B) transcription enzyme
 - C) translation enzyme
 - D) transfer enzyme
 - E) none is correct
20. Find the codon that represents first aminoacid:
- A) AUG
 - B) UAA
 - C) UAG
 - D) UGA
 - E) AGG
21. Which sequence in DNA is complementary to ...AATTCGCGTGGC...?
- A) ...CCGGTATAGAAT...
 - B) ...TTUUGCGCUCCG...
 - C) ...TTAAGCGCACCG...
 - D) ...UUAAGCGCUGCC...
 - E) ...UUCCGAGACAAG...
22. The pyrimidine nitrogenous bases in DNA molecule are:
- A) adenine and guanine
 - B) adenine and thymine
 - C) cytosine and thymine
 - D) guanine and thymine
 - E) cytosine and uracil
23. The number of 92 chromosomes in human cells refers to:
- A) monoploidy
 - B) diploidy
 - C) triploidy
 - D) tetraploidy
 - E) aneuploidy
24. Potential of hydrogen (pH) of blood is:
- A) 5.4
 - B) 6.4
 - C) 7.4
 - D) 8.4
 - E) 9.4

25. The most abundant leukocytes are:
- A) neutrophils
 - B) eosinophils
 - C) basophils
 - D) lymphocytes
 - E) monocytes
26. Which of the following organs is not included in the hematopoiesis:
- A) lymph node
 - B) spleen
 - C) thymus
 - D) red bone marrow
 - E) yellow bone marrow
27. Secondary pacemaker or:
- A) sinoatrial node
 - B) atrioventricular node
 - C) bundle of His
 - D) Purkinje fibers
 - E) conducting fiber
28. Digestion of fats begins in:
- A) oral cavity
 - B) esophagus
 - C) stomach
 - D) small intestine
 - E) large intestine
29. Goiter is related to lack of:
- A) vitamin A
 - B) vitamin D
 - C) iron
 - D) calcium
 - E) iodine
30. Center for body temperature regulation is located in:
- A) thalamus
 - B) hypothalamus
 - C) hypophysis
 - D) adrenal gland
 - E) skin

31. A universal blood donor is a person with the blood type:
- A) A
 - B) B
 - C) AB
 - D) O
 - E) Rh+
32. During an allergic reaction, immune cells secrete:
- A) heparin
 - B) histamine
 - C) thrombin
 - D) allergens
 - E) fibrin
33. Intermediate pituitary hormone is:
- A) somatotrophic hormone
 - B) thyroid stimulating hormone
 - C) prolactin
 - D) melanocyte stimulating hormone
 - E) oxytocin
34. Graaf's follicle transforms into:
- A) ruptured follicle
 - B) corpus luteum
 - C) egg
 - D) zygote
 - E) placenta
35. Mesoderm gives rise to:
- A) skin
 - B) nerves
 - C) cardiac muscle
 - D) lungs
 - E) stomach
36. Ecosystem is:
- A) biotope + biocenosis
 - B) biotope + biome
 - C) biotope + population
 - D) biotope + biosphere
 - E) ecosystem + population

37. The area where a particular species can be found during their lifetime is called:
- A) biotope
 - B) land reclamation
 - C) species range
 - D) species amplitude
 - E) ecosystem
38. A group of organisms or individuals of the same species that live in a particular geographical area and are able to interbreed constitutes:
- A) a population
 - B) a clone
 - C) a generation
 - D) a biological community
 - E) an ecosystem
39. Find the largest hierarchical unit (top of the hierarchy):
- A) kingdom
 - B) class
 - C) order
 - D) family
 - E) species
40. In binomial nomenclature, created by Carl Linnaeus:
- A) the first part of the name identifies the species, the second part identifies the genus
 - B) the first part of the name identifies the family, the second part identifies the species
 - C) the first part of the name identifies the genus, the second part identifies the order
 - D) the first part of the name identifies the order, the second part identifies the class
 - E) the first part of the name identifies the genus, the second part identifies the species

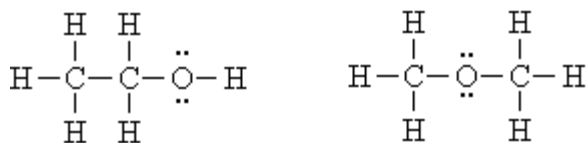
41. The major constituent of air is:
- A) carbon dioxide
 - B) nitrogen
 - C) hydrogen
 - D) helium
 - E) oxygen
42. Activation energy can be lowered by:
- A) an inhibitor
 - B) an indicator
 - C) an oxidant
 - D) an insulator
 - E) a catalyst
43. In the Brønsted-Lowry theory, a base is defined as:
- A) a proton acceptor.
 - B) a water-former.
 - C) a proton donor.
 - D) a hydroxide donor.
 - E) an electron-pair acceptor.
44. Avogadro's law states that the volume of a gas is directly related to the moles of the gas present. If the moles of gas present are halved, what happens to its volume if pressure and temperature are constant?
- A) The volume is halved.
 - B) There is no change in volume.
 - C) The volume is doubled.
 - D) The volume is increased by 1/4.
 - E) The volume is decreased by 1/4.
45. Equation: $\text{NaCl(s)} \rightarrow \text{Na}^{\text{+}}(\text{aq}) + \text{Cl}^{-}(\text{aq})$ represents:
- A) reduction of chlorine
 - B) hydrolysis of sodium chloride
 - C) dissociation of sodium chloride
 - D) reduction of sodium
 - E) oxidation of sodium
46. Which of the following is INCORRECT for decane, $\text{C}_{10}\text{H}_{22}$?
- A) it is insoluble in water
 - B) it is highly volatile
 - C) it is a liquid at room temperature
 - D) it contains only covalent bonds
 - E) it is a nonelectrolyte

47. What is formed in the reaction of potassium oxide with water?
- A) KOH
 - B) $K(OH)_2$
 - C) $KOH \times H_2O$
 - D) $K(OH)_3$
 - E) $KO + H_2 + O_2$
48. Which compound is converted to propanone by oxidation?
- A) propan-1-ol
 - B) propan-2-ol
 - C) propanal
 - D) propanoic acid
 - E) butane
49. What of the following is classified as an aromatic compound?
- A) cyclopropane
 - B) C_5H_{10}
 - C) glucose
 - D) cyclohexane
 - E) toluene
50. What of the following represents a salt?
- A) CH_3COONH_2
 - B) NaOH
 - C) CH_3NH_2
 - D) NH_3
 - E) NH_4Cl
51. Which statement is NOT TRUE?
- A) Aldehydes and ketones contain a carbonyl group, which is strongly polar.
 - B) Chiral molecules are molecules with mirror images that cannot be superimposed on each other.
 - C) Secondary alcohols are oxidized to ketones.
 - D) The functional group of an alcohol is the hydroxyl group bonded to a carbon atom.
 - E) In aldehydes, the carbonyl group is located between two alkyl or aromatic groups.
52. The number of water molecules is the largest in:
- A) 1.8 moles of water
 - B) 18 grams of water
 - C) 18 moles of water
 - D) 1.8 grams of water
 - E) 18 molecules of water

53. All compounds are ionic except:
- A) KNO_3
 - B) AgCl
 - C) NO_2
 - D) $(\text{NH}_4)_2\text{CO}_3$
 - E) KOH
54. Which of the following bonds is nonpolar covalent?
- A) Si-F
 - B) Br-Br
 - C) Si-Br
 - D) N-P
 - E) Br-F
55. Which of the following does not have a noble gas electron configuration?
- A) S^{2-}
 - B) Al^{3+}
 - C) Sb^{3-}
 - D) Sc^{3+}
 - E) Ba^+
56. Reactants for the preparation of an ester could be:
- A) a ketone and an alcohol
 - B) an alkane and a ketone
 - C) an acid and an alcohol
 - D) an amine and an acid
 - E) only an acid
57. When but-2-ene reacts completely with bromine, the product is
- A) 1,2-dibromobutane.
 - B) 1,3-dibromobutane.
 - C) 2,3-dibromobutane.
 - D) 3-bromobutane.
 - E) 2-bromobutane.
58. What is correct for carboxylic acids?
- A) They contain -CHO group.
 - B) They form amides with alcohols.
 - C) They contain phenyl group.
 - D) Oleic acid is carboxylic acid.
 - E) They give ketones by reduction.

59. In an exothermic reaction, the final energy content of the products
- depends on the concentration of reactants.
 - depends on the catalyst used.
 - does not depend on the energy content of reactants.
 - is lower than energy content of reactants.
 - is higher than energy content of reactants.
60. Which of the following will undergo an addition reaction with chlorine?
- $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_3$
 - $\text{CH}_3\text{CH}_2\text{OH}$
 - C_6H_6
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
 - $\text{CH}_3\text{CH}_2\text{COOH}$
61. Which is NOT true for the two-carbon aldehyde?
- higher boiling point than an alcohol of similar molecular weight
 - condensed formula CH_3CHO
 - structural formula:
$$\begin{array}{c} \text{H} \quad \text{O} \\ | \quad // \\ \text{H}-\text{C}-\text{C} \\ | \quad \backslash \\ \text{H} \quad \text{H} \end{array}$$
 - systematic name ethanal
 - common name acetaldehyde
62. Which is the correct formula for the ionic compound containing iron(III) ions and oxide ions?
- FeO_2
 - Fe_2O_3
 - FeO
 - Fe_2O_2
 - Fe_3O_2
63. Which of the following name/symbol combinations of elements is correct?
- nitrogen/N
 - iron/I
 - sodium/S
 - potassium/P
 - barium/B
64. How much NaCl is dissolved in 1 kg of 20% aqueous solution?
- 0.20 kg
 - 0.10 kg
 - 0.50 kg
 - 20 g
 - 50 g

65. How are the following compounds related?



- A) they are isomers
 B) they are isotopes
 C) both are carbohydrates
 D) both are unsaturated
 E) these compounds are not related. They are completely different.
66. Compared to solids, liquids usually
- A) contain more particles with low kinetic energy
 B) are highly compressible
 C) have stronger attractions between particles
 D) have lesser distances between particles
 E) have greater distances between particles
67. Acetic acid, CH_3COOH , is an example of:
- A) an amino acid
 B) a weak electrolyte
 C) a strong electrolyte
 D) a hydroxy acid
 E) a carbohydrate
68. Which element has the largest atomic radius?
- A) I
 B) Rb
 C) Li
 D) F
 E) Na
69. Which factor is the most important in determining the chemical properties of organic molecules?
- A) the functional groups
 B) the number of carbon-carbon bonds
 C) the melting point
 D) the number of carbon-hydrogen bonds
 E) the number of branches in the carbon chain

70. What is the mass fraction of copper in Cu_2O ?
- A) 0.9993
 - B) 0.4441
 - C) 0.7771
 - D) 0.2221
 - E) 0.8882
71. Which list includes all the elements that are present in an alkane with an amine group?
- A) C, H, N
 - B) C, H, O
 - C) C, H, O, H
 - D) H, N
 - E) C, H
72. Mass of a proton is similar to the mass of
- A) a deuterium atom
 - B) an electron
 - C) a photon
 - D) a neutron
 - E) a positron
73. Which of the following is a strong electrolyte in water?
- A) NH_3
 - B) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
 - C) CH_3OCH_3
 - D) KOH
 - E) $\text{C}_2\text{H}_5\text{OH}$
74. What is the IUPAC name for the following compound?
- $$\begin{array}{c} \text{H}_3\text{C} \quad \text{CH}_3 \\ | \quad | \\ \text{CH}_3\text{C} - \text{CCH}_2\text{CH}_2\text{CH}_3 \\ | \quad | \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$$
- A) 2,3,3-trimethylpentane
 - B) 1,1,2,2-tetramethylbutane
 - C) 2,3,3-trimethylhexane
 - D) 2,2,3,3-tetramethylpentane
 - E) 2,2,3,3-tetramethylhexane

75. For the following reaction: $2 A \leftrightarrow 2 C + D$, the expression for the equilibrium constant is:
- A) $[C]^2[D]/[A]^2$
 - B) $[C]^2/[A]^2[D]$
 - C) $[A]^2/[C][D]$
 - D) $[A]^2/[C]^2[D]$
 - E) $[A][C]$
76. Which of the following does NOT represent a chemical change?
- A) burning of wood
 - B) food digestion
 - C) fractional distillation of petroleum
 - D) rusting of iron
 - E) process that occurs when a piece of iron is put into hydrochloric acid
77. Product of ethanol dehydration is:
- A) ethanoic acid
 - B) ethane
 - C) ethyne
 - D) ethene
 - E) ethanal
78. The hybridization of carbon atoms in alkanes is:
- A) sp^3d
 - B) sp^3d^2
 - C) sp^3
 - D) sp^2
 - E) sp
79. Which of these species is the weakest acid?
- A) HCl
 - B) HNO_3
 - C) H_3PO_4
 - D) $H_2PO_4^-$
 - E) HPO_4^{2-}
80. A molecule of which alcohol contains more than one hydroxyl group?
- A) butanol
 - B) propanol
 - C) pentan-2-ol
 - D) pentanol
 - E) glycerol

81. Which of the following is a base unit of measurement in the International System of units?
- A) Candela
 - B) Tesla
 - C) Watt
 - D) Volt
 - E) Hertz
82. A runner has increased his speed by 10%. What will be the runner's kinetic energy if his kinetic energy before acceleration was 10 kJ?
- A) 11.1 kJ
 - B) 12.1 kJ
 - C) 11 kJ
 - D) 15 kJ
 - E) 9 kJ
83. Two equal forces F act on the body in the same plane and have a vertex in the same point. If the angle between the two forces of equal magnitudes is 360° , then the amount of the resulting force is:
- A) $2 F$
 - B) 0
 - C) $\sqrt{2} F$
 - D) $1/2 F$
 - E) F^2
84. How long will it take a stone dropped from a bridge (with the height of 80 meters) to hit the surface of the water? Let us suppose that the stone is falling freely under gravity. ($g = 10 \text{ m/s}^2$)
- A) 2 s
 - B) 8 s
 - C) 4 s
 - D) 10 s
 - E) 5 s

85. The body with a mass of 1 kg has a kinetic energy of 200 J at the moment when it hits the land. Neglecting the air resistance, calculate the height from which the body was dropped.
($g = 10 \text{ m/s}^2$)
A) 30 m
B) 20 m
C) 15 m
D) 10 m
E) 40 m
86. How much torque does a person produce if he applies a 12 N force 1 m away from the pivot point, perpendicularly to the lever arm?
A) 1/144 Nm
B) 1/12 Nm
C) 12 Nm
D) 144 Nm
E) 0 Nm
87. An object's angular velocity changes from 3 rad/s clockwise to 8 rad/s clockwise in 5 s. What is its angular acceleration?
A) 0.6 rad/s^2
B) 1.6 rad/s^2
C) 1 rad/s^2
D) 5 rad/s^2
E) 0.5 rad/s^2
88. What is the force needed at 1.2 m away from the fulcrum to lift a mass of 15 kg located on the other side 20 cm from the fulcrum?
A) 2.5 N
B) 25 N
C) 50 N
D) 5 N
E) 250 N
89. Sound waves do not travel through vacuum because:
A) they are transverse waves
B) they are electromagnetic waves
C) they are stationary waves
D) they do not have enough energy
E) they require material medium for propagation

90. It is possible to distinguish between transverse and longitudinal waves from the property of:
- A) refraction
 - B) reflection
 - C) diffraction
 - D) polarization
 - E) interference
91. In order to double the period of a simple pendulum, the length of the string should be:
- A) decreased two times
 - B) increased two times
 - C) increased four times
 - D) decreased four times
 - E) the same
92. If the system oscillates with a frequency of 0.5 Hz, its period of oscillation is:
- A) 0.5 s
 - B) 1 s
 - C) 2 s
 - D) 0.2 s
 - E) 10 s
93. The atmospheric pressure at sea level is approximately:
- A) 10^3 Pa
 - B) 10^6 Pa
 - C) 10^{-5} Pa
 - D) 10^{-6} Pa
 - E) 10^5 Pa
94. The body floats on the surface of the liquid if:
- A) $\rho_{\text{liquid}} = \rho_{\text{body}}$
 - B) $\rho_{\text{liquid}} < \rho_{\text{body}}$
 - C) $\rho_{\text{liquid}} > \rho_{\text{body}}$
 - D) $V_{\text{liquid}} = V_{\text{body}}$
 - E) $m_{\text{liquid}} = m_{\text{body}}$

95. What is the hydrostatic pressure at a depth of 1 m below the water surface? (density of water = 1000 kg/m^3 , $g = 9.81 \text{ m/s}^2$)
- A) 9810 Pa
 - B) 980 Pa
 - C) 98 Pa
 - D) 1 Pa
 - E) 10 Pa
96. If a liquid enters a pipe of diameter d with a velocity v , what will be its velocity at the exit if the diameter reduces to $0.5d$?
- A) v
 - B) $0.5v$
 - C) $2v$
 - D) $4v$
 - E) $0.2v$
97. In the isobaric process, the volume of gas increases twice. What was the initial temperature of the gas if the final gas temperature is $27 \text{ }^\circ\text{C}$?
- A) 150 K
 - B) 300 K
 - C) $150 \text{ }^\circ\text{C}$
 - D) $300 \text{ }^\circ\text{C}$
 - E) $13.5 \text{ }^\circ\text{C}$
98. How much heat does iron with a mass of 40 g receive when it is heated from $0 \text{ }^\circ\text{C}$ to 300 K considering that the specific heat capacity of iron is 460 J/(kgK) ?
- A) 4.968 kJ
 - B) 5520 J
 - C) 4968 J
 - D) 496.8 J
 - E) 552 J
99. What will be the temperature of the mixture if you mix 1 kg of water with a temperature of $80 \text{ }^\circ\text{C}$ and 2 kg of water with a temperature of $20 \text{ }^\circ\text{C}$? (The specific heat capacity of water is 4186 J/(kgK) .)
- A) $30 \text{ }^\circ\text{C}$
 - B) $40 \text{ }^\circ\text{C}$
 - C) $50 \text{ }^\circ\text{C}$
 - D) $60 \text{ }^\circ\text{C}$
 - E) $70 \text{ }^\circ\text{C}$

100. What is conserved according to the first law of thermodynamics?
- A) mass
 - B) work
 - C) energy
 - D) heat
 - E) temperature
101. An operating lamp draws a current of 0.4 ampere. The amount of charge passing through the lamp in 10 seconds is:
- A) 0.045 C
 - B) 4 C
 - C) 5 C
 - D) 6.24 C
 - E) 0.4 C
102. To increase the brightness of a desk lamp a student replaced a 50 W light bulb with a 100 W light bulb. Compared to the 50 W light bulb, the 100 W light bulb has:
- A) less resistance and draws more current
 - B) less resistance and draws less current
 - C) more resistance and draws more current
 - D) more resistance and draws less current
 - E) equal resistance and draws the same current
103. An electric dryer consumes 6.0×10^6 J of energy when operating at 220 V for 30 minutes. During operation, the dryer draws a current of approximately:
- A) 10 A
 - B) 15 A
 - C) 20 A
 - D) 25 A
 - E) 30 A
104. When 8.0 eV photons strike a photoemissive surface, the maximum kinetic energy of ejected photoelectrons is 6.0 eV. The work function of the photoemissive surface is:
- A) 0.01 eV
 - B) 1 eV
 - C) 2 eV
 - D) 3 eV
 - E) 0.1 eV

105. In a transformer, two coils are wound around a common iron core. To operate properly, the transformer requires:
- A) more turns in the secondary coil than in the primary coil
 - B) more turns in the primary coil than in the secondary coil
 - C) equal number of turns in primary and secondary coil
 - D) a direct current source connecting to the secondary coil
 - E) an altering current source connecting to the primary coil
106. Total capacitance of a 300 mF capacitor and a 150 mF capacitor connected in series is:
- A) 300 mF
 - B) 450 mF
 - C) 200 mF
 - D) 100 mF
 - E) 900 mF
107. The transformer on a power pole steps down the voltage from 10 800 V to 120 V. If the secondary coil contains 360 turns, how many turns are found on the primary coil?
- A) 603
 - B) 900
 - C) 15 000
 - D) 3 600
 - E) 32 400
108. If a 15 Ω resistor is connected in parallel with a 30 Ω resistor, the equivalent resistance is:
- A) 1 Ω
 - B) 5 Ω
 - C) 7 Ω
 - D) 10 Ω
 - E) 15 Ω
109. A wire carries a current of 2 A. How many electrons pass a given point in this wire in 1 second? ($e = 1.6 \times 10^{-19}$ C)
- A) 1.3×10^{18}
 - B) 2×10^{18}
 - C) 3×10^{18}
 - D) 4×10^{16}
 - E) 1.25×10^{19}

110. What is the index of refraction of the medium if the reflected light is completely linearly polarized at the refraction angle of 30° ?
- A) 1.73
 - B) 1.5
 - C) 0.58
 - D) 1.33
 - E) 1.15
111. Which phenomenon can occur with light but not with sound?
- A) Doppler effect
 - B) interference
 - C) polarization
 - D) refraction
 - E) reflection
112. A spherical mirror that forms only virtual images has a radius of curvature of 0.5 meters. The focal length of this mirror is?
- A) -0.125 m
 - B) -0.25 m
 - C) 2.5 m
 - D) 2.75 m
 - E) 0.5 m
113. A spherical concave mirror is used in the back of a car headlight. Where should the bulb of the headlight be located to produce a parallel beam of reflected light?
- A) between the principal focus and the mirror
 - B) beyond the centre of curvature of the mirror
 - C) at the principal focus of the mirror
 - D) at the centre of curvature of the mirror
 - E) between the principal focus and the centre of curvature of the mirror
114. A diverging (convex) lens can form images that are:
- A) only virtual
 - B) only inverted
 - C) either virtual or real
 - D) either inverted or erect
 - E) only real

115. A ray of light strikes a plane mirror at an angle of incidence equal to 35 degrees. The angle between the incidence ray and the reflected ray is:
- A) 45 degrees
 - B) 60 degrees
 - C) 35 degrees
 - D) 80 degrees
 - E) 70 degrees
116. What is the speed of light in a medium having an absolute refractive index of 2.3?
- A) 0.77×10^7 m/s
 - B) 1.3×10^8 m/s
 - C) 3×10^8 m/s
 - D) 2.3×10^8 m/s
 - E) 1.5×10^8 m/s
117. What is the approximate bind energy of a helium nucleus that has a mass defect of 5.2×10^{-29} kg? ($c = 3 \times 10^8$ m/s)
- A) 4×10^8 J
 - B) 6.3×10^{-18} J
 - C) 4.7×10^{-12} J
 - D) 1.6×10^8 J
 - E) 4.7×10^{-13} J
118. Which of the following electromagnetic waves have the highest wavelength?
- A) infrared waves
 - B) radio waves
 - C) ultraviolet waves
 - D) gamma rays
 - E) X-rays
119. A 96-gram sample of a radioactive nuclide is placed in a container. After 12 minutes, only 6 grams of the sample has not yet decayed. What is the half-life of the nuclide?
- A) 2 minutes
 - B) 3 minutes
 - C) 4 minutes
 - D) 5 minutes
 - E) 6 minutes

120. The neutrons in an atom:
- A) contribute to the nuclear charge
 - B) revolve around the nucleus in elliptical orbits
 - C) vary in number in different isotopes
 - D) equal in number to the total number of protons
 - E) equal in number to the number of electrons