THE PRINCIPLES OF PHYSICAL SCIENCE I

EXAM INFORMATION

This exam was developed to enable schools to award credit to students for knowledge equivalent to that learned by students taking the course. This examination includes an overview of Newton's Laws of Motion; energy and momentum; thermodynamics; wave and optics; electricity and magnetism; chemistry: properties of matter; atomic theory and structure; and chemical reactions.

The exam contains 100 questions to be answered in 2 hours.

Form Codes: SP512, SN512, SY512, SZ512

CREDIT RECOMMENDATIONS

The American Council on Education's College Credit Recommendation Service (ACE CREDIT) has evaluated the DSST test development process and content of this exam. It has made the following recommendations:

Area or Course Equivalent: The Principles of Physical Science I
Level: Lower-level baccalaureate
Amount of Credit: 3 Semester Hours
Minimum Score: 400
Source: www.acenet.edu

EXAM CONTENT OUTLINE

The following is an outline of the content areas covered in the examination. The approximate percentage of the examination devoted to each content area is also noted.

- I. **Physics – 50%**
    - a. Newton's laws of motion
        - i. Motion
        - ii. Force and acceleration
        - iii. Inertia
        - iv. Mass and weight
        - v. Action/reaction forces
        - vi. Law of circular motion
        - vii. Law of universal gravitation
    - b. Energy and momentum
        - i. Work
        - ii. Power
        - iii. Potential and kinetic energy
        - iv. Momentum
        - v. Conservation of Energy & Momentum
        - vi. Collisions
    - c. Thermodynamics
        - i. Temperature and heat
        - ii. Heat transfer
        - iii. Heat capacity
        - iv. Changes in state
        - v. Mechanical equivalent of heat
        - vi. Heat Engine
        - vii. Entropy
    - d. Waves and optics

    i. Reflection and refraction
    ii. Lenses and mirrors
    iii. Waves
    iv. Interference and diffraction
    v. Sound
  e. Electricity and magnetism
    i. Electronic charges (Coulomb's Law)
    ii. Electric current
    iii. Potential differences
    iv. Ohm's law
    v. Magnetism
    vi. Electromagnetism
    vii. Circuits and applied electricity
    viii. Gauss' Law
    ix. Lorentz Force
    x. Faraday's Law
  f. Fluids
    i. Density
    ii. Pressure
    iii. Pascal's Principle
    iv. Archimedes' Principle
    v. Bernoulli's Equation
  g. Kinematics
    i. Units and measures
    ii. Scalers and vectors
    iii. One dimensional kinematics
    iv. Two dimensional kinematics

II. Chemistry – 50%
  a. Properties of matter & measurement
    i. Significant Figures
    ii. Metric System
    iii. Chemical & physical properties
    iv. Elements, Compounds, Mixtures, Solutions
    v. Accuracy and Precision
  b. Atoms, molecules & ions
    i. Subatomic particles
    ii. The atomic model
    iii. Periodic table
    iv. Molecules
    v. Ions
    vi. Empirical/molecular formula
    vii. Nomenclature
  c. Stoichiometry
    i. Balancing molecular equations
    ii. Avogadro's number & the mole
    iii. Stoichiometry ratios
    iv. Limiting reagent
    v. Theoretic yield
  d. Gas laws
    i. Basic gas laws
    ii. Ideal gas law

   iii. Partial pressures
   iv. Effusion & diffusion
   v. Real gases
 e. Thermochemistry
   i. Conservation of energy
   ii. Heat/temperature
   iii. Work
   iv. Heat Capacity
   v. Calorimetry
   vi. Enthalpy
   vii. Hess's Law
   viii. Entropy
   ix. Gibb's free energy
 f. Quantum mechanical theory
   i. Wave/light properties
   ii. Wave-particle duality
   iii. Bohr's model
   iv. Quantum numbers
   v. Orbitals
   vi. Electron configurations
   vii. Periodic trend
 g. Bonding theory
   i. Valence bonding theory
   ii. Molecular Orbital Diagrams
   iii. Hybridization
   iv. Lattice energy
   v. Lewis dot structures
   vi. Vsepr theory
   vii. Intermolecular forces/effects
 h. Solution chemistry
   i. Concentration
   ii. Solution stoichiometry
   iii. Acid/base
   iv. Redox
   v. Solubility/precipitation
   vi. Colligative properties
   vii. Solution Energetics
 i. Equilibrium
   i. General
   ii. Acid/base
   iii. Titration
   iv. Solubility products
   v. Le Chatlier
   vi. Common ion effect
   vii. Equilibrium constants
   viii. Buffer solutions
   ix. Henderson-Hasselbalch equation
 j. Chemical kinetics
   i. Reaction rate
   ii. Rate law
   iii. Order of reaction

iv.   Integrated rate laws
                  v.   Method of initial rates
                  vi.   Collision Theory
                  vii. Transition State Theory
                  viii. Effect of temperature on reaction rate
                  ix.   Reaction mechanisms
                  x.   Catalysis
         k. Electrochemistry
                  i.   Oxidation reduction
                  ii.   Balancing redox
                  iii. Voltaic cells, batteries
                  iv.   Electrochemical cells
                  v.   Standard Electrode Potentials
                  vi.   Faraday's constant and Gibbs' free energy
                  vii. Equilibrium
                  viii. Predicting Spontaneous
                  ix.   Electrolysis
         l. Nuclear chemistry
                  i.   Balancing
                  ii.   Half life
                  iii. Nuclear stability
                  iv.   Types of radio activity
                  v.   Dating
                  vi.   Fission and fusion
                  vii. Mass defect
         m. Coordinating chemistry
                  i.   Naming
                  ii.   Ligands
                  iii. Isomerization
                  iv.   Werner complexes
                  v.   Crystal field theory
                  vi.   Ligand field theory

REFERENCES

Below is a list of reference publications that were either used as a reference to create the exam, or were used as textbooks in college courses of the same or similar title at the time the test was developed. You may reference either the current edition of these titles or textbooks currently used at a local college or university for the same class title. It is recommended that you reference more than one textbook on the topics outlined in this fact sheet.

You should begin by checking textbook content against the content outline provided before selecting textbooks that cover the test content from which to study.

Sources for study material are suggested but not limited to the following:

1. Cutnell, J.D. (2013). Physics. Wiley, current edition.
2. Giancoli, D.C. (2013). Physics: Principles with Applications. Current edition.
3. Tro, N.J. (2013). Chemistry: A Molecular Approach. Prentice Hall, current edition.

SAMPLE QUESTIONS

All test questions are in a multiple-choice format, with one correct answer and three incorrect options. The following are samples of the types of questions that may appear on the exam.

1. Which of the following properties of fluids can serve to distinguish between a gas and a liquid?
   a. Immiscibility
   b. Malleability
   c. Viscosity
   d. Compressibility
2. A substance that alters the rate of a chemical reaction but is not itself altered is called a
   a. catalyst
   b. reactant
   c. product
   d. limiting agent
3. In which of the following cases is the vehicle described NOT accelerating?
   a. A car traveling in a straight line, increasing its speed from 10 meters per second to 20 meters per second
   b. A bus traveling at a constant speed over the crest of a hill
   c. A train traveling in a straight line at a constant speed
   d. A car traveling at 15 meters per second around a curve
4. The best explanation for the location of the element helium in the periodic table is that it
   a. has a filled outer shell
   b. has a low density
   c. is monatomic
   d. is a nonmetal
5. Two forces, one of 300 Newtons and the other of 400 Newtons, act at right angles to each other. The magnitude of the resultant force is
   a. 100 N
   b. between 300 N and 400 N
   c. 500 N
   d. 700 N
6. Which of the following is true when the pendulum of a clock reaches the highest point of its arc?
   a. The net force acting on the system is zero
   b. The kinetic energy is maximum
   c. The potential energy is maximum
   d. The frequency is zero
7. If the half-life of a certain isotope is one month, what portion of a sample of this isotope remains after two months?
   a. None
   b. One-fourth
   c. One-third
   d. Three-fourths
8. If the distance between a proton and an electron is doubled, the resulting attraction will be
   a. four times as great
   b. twice as great
   c. half as great
   d. one-fourth as great
9. The heat that is required to raise the temperature of 10 grams of a sample whose specific heat is 0.212 calories/gram °C from 30° C to 50° C would be
   a. 200.0 cal
   b. 42.4 cal
   c. 4.24 cal

d. 2.0 cal

10. In the Earth-Moon system, if r is the distance between the two masses, the attracting force between them is
    a. directly proportional to r
    b. directly proportional to r 2
    c. inversely proportional to r
    d. inversely proportional to r 2

11. The work done in holding a 50-newton object at 2 meters above a table top is
    a. 980 J
    b. 100 J
    c. 25 J
    d. 0 J

12. Which of the following statements regarding the force on an object in circular motion is NOT true?
    a. It is inversely proportional to the period squared
    b. It is inversely proportional to the mass
    c. It is directly proportional to the velocity
    d. It is directly proportional to the acceleration

Answers to sample questions:

1-D; 2-A; 3-C; 4-A; 5-C; 6- C; 7-B; 8-D; 9-B; 10-D; 11-D; 12-B