

DSST® 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.

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

1. Motion
2. Force and acceleration
3. Inertia
4. Mass and weight
5. Action/reaction forces
6. Law of circular motion
7. Law of universal gravitation

b. Energy and momentum

1. Work
2. Power
3. Potential and kinetic energy
4. Momentum
5. Conservation of Energy & Momentum
6. Collisions

c. Thermodynamics

1. Temperature and heat
2. Heat transfer
3. Heat capacity
4. Changes in state
5. Mechanical equivalent of heat
6. Heat Engine
7. Entropy

d. Waves and optics

1. Reflection and refraction
2. Lenses and mirrors
3. Waves
4. Interference and diffraction
5. Sound

e. Electricity and magnetism

1. Electronic charges (Coulomb's Law)
2. Electric current
3. Potential differences

4. Ohm's law
5. Magnetism
6. Electromagnetism
7. Circuits and applied electricity
8. Gauss' Law
9. Lorentz Force
10. Faraday's Law

f. Fluids

1. Density
2. Pressure
3. Pascal's Principle
4. Archimedes' Principle
5. Bernoulli's Equation

g. Kinematics

1. Units and measures
2. Scalars and vectors
3. One dimensional kinematics
4. Two dimensional kinematics

II. Chemistry – 50%

a. Properties of matter & measurement

1. Significant Figures
2. Metric System
3. Chemical & physical properties
4. Elements, Compounds, Mixtures, Solutions
5. Accuracy and Precision

b. Atoms, molecules & ions

1. Subatomic particles
2. The atomic model
3. Periodic table
4. Molecules
5. Ions
6. Empirical/molecular formula
7. Nomenclature

c. Stoichiometry

1. Balancing molecular equations
2. Avogadro's number & the mole
3. Stoichiometry ratios
4. Limiting reagent
5. Theoretic yield

d. Gas laws

1. Basic gas laws
2. Ideal gas law
3. Partial pressures
4. Effusion & diffusion
5. Real gases

e. Thermochemistry

1. Conservation of energy
2. Heat/temperature
3. Work
4. Heat Capacity
5. Calorimetry
6. Enthalpy
7. Hess's Law
8. Entropy
9. Gibb's free energy

- f. Quantum mechanical theory**
 1. Wave/light properties
 2. Wave-particle duality
 3. Bohr's model
 4. Quantum numbers
 5. Orbitals
 6. Electron configurations
 7. Periodic trend
- g. Bonding theory**
 1. Valence bonding theory
 2. Molecular Orbital Diagrams
 3. Hybridization
 4. Lattice energy
 5. Lewis dot structures
 6. Vsepr theory
 7. Intermolecular forces/effects
- h. Solution chemistry**
 1. Concentration
 2. Solution stoichiometry
 3. Acid/base
 4. Redox
 5. Solubility/precipitation
 6. Colligative properties
 7. Solution Energetics
- i. Equilibrium**
 1. General
 2. Acid/base
 3. Titration
 4. Solubility products
 5. Le Chatlier
 6. Common ion effect
 7. Equilibrium constants
 8. Buffer solutions
 9. Henderson-Hasselbalch equation
- j. Chemical kinetics**
 1. Reaction rate
 2. Rate law
 3. Order of reaction
 4. Integrated rate laws
 5. Method of initial rates
 6. Collision Theory
 7. Transition State Theory
 8. Effect of temperature on reaction rate
 9. Reaction mechanisms
 10. Catalysis
- k. Electrochemistry**
 1. Oxidation reduction
 2. Balancing redox
 3. Voltaic cells, batteries
 4. Electrochemical cells
 5. Standard Electrode Potentials
 6. Faraday's constant and Gibbs' free energy

7. Equilibrium
8. Predicting Spontaneous
9. Electrolysis

l. Nuclear chemistry

1. Balancing
2. Half life
3. Nuclear stability
4. Types of radio activity
5. Dating
6. Fission and fusion
7. Mass defect

m. Coordinating chemistry

1. Naming
2. Ligands
3. Isomerization
4. Werner complexes
5. Crystal field theory
6. 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. These are samples of the types of questions that may appear on the exam. Other sample questions can be found in the form of practice exams by visiting our website at www.getcollegcredit.com/testprep.

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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

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	Principles of Physical Science
Level	Lower-level baccalaureate
Amount of Credit	Three (3) semester hours
Minimum Score	400
Source	American Council on Education – College Credit Recommendation Service

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

