

Please read each question carefully. Each question worth's 1 point.
For the following questions, please circle the correct answer.

Part 1.

1. An object maintains its state of motion because it has
A) mass B) weight C) speed
D) acceleration E) all of the above.
2. A car accelerates from rest at 2 m/s^2 . What is its speed (in m/s) 3 s after the car starts moving?
A) 2 B) 3 C) 4 D) 6 E) none of the above.
3. An object travels **8 m** in the first second of travel, **8 m** again during the second second of travel, and **8 m** again during the third second. Its acceleration in m/s^2 is
A) zero B) 5 C) 8 D) 10
E) not enough information to estimate the speed.
4. It takes **6 s** for a stone to fall to the bottom of a mine shaft. How deep is the shaft?
A) 60 m B) 120 m C) 180 m D) 200 m E) none of the above
5. A bullet is dropped into a river from a very high bridge. At the same time, another bullet is fired from a gun, straight down towards the water. Neglecting air resistance, the acceleration just before striking the water
A) is greater for the dropped bullet. B) is greater for the fired bullet.
C) is the same for each bullet. D) depends on how high they started.
E) none of the above.
6. The average momentum (in kg.m/s) of a **70 kg** runner who covers **400 m** in **50 s** is
A) 8.75 B) 57 C) 560 D) 5490 E) none of the above.
7. A rifle of mass **2.0 kg** is suspended by strings. The rifle fires a bullet of mass **0.01 kg** at a speed of **200 m/s**. The velocity (in m/s) of the rifle after firing the bullet is about
A) 0.001 B) 0.01 C) 0.1 D) 1 E) none of the above

8. A **2 kg** mass is held **4 m** above the ground. What is the approximate potential energy of the mass with respect to the ground?
- A) 20 J B) 40 J C) 60 J D) 80 J E) none of the above.
9. If a projectile is fired straight up at a speed of **10 m/s**, the time (in s) it takes to reach the top of its path is about
- A) 1 B) 2 C) 5 D) 10 E) none of the above.
10. A fish normally displaces its own
- A) volume of water. B) weight of water. C) area of water.
D) both A and B E) A, B and C.
11. Your feet feel warmer on a rug than on a tile floor because the rug
- A) is usually warmer than tile. B) is a better insulator than tile.
C) for the same mass has more thermal energy than tile.
D) all of the above E) none of the above.
12. The planet Earth loses heat mainly by
- A) conduction. B) convection. C) radiation.
D) all of the above E) none of the above.
13. A positive ion has more
- A) electrons than neutrons. B) electrons than protons.
C) protons than electrons. D) protons than neutrons.
E) neutrons than protons.
14. To say that electric charge is conserved is to say that electric charge
- A) may occur in an infinite variety of quantities.
B) is a whole-number multiple of the charge of one electron.
C) will interact with neighboring electric charges.
D) can neither be created nor destroyed.
E) none of the above.
15. Two charges separated by one meter exert a **1 N** force on each other. If the charges are pushed to **0.25 m** separation, the force on each charge will be
- A) 1 N. B) 2 N. C) 4 N. D) 8 N. E) 16 N.

16. The electrical force on a **2 C** charge is **60 N**. What is the value of the electric field at the place where the charge is located?

- A) 20 N/C. B) 30 N/C. C) 60 N/C.
D) 120 N/C. E) not enough information.

17. An electron is pushed into an electric field where it acquires a **1 V** electrical potential. If two electrons are pushed the same distance into the same electric field, the electrical potential of the two electrons is

- A) 0.25 V. B) 0.5 V. C) 1.0 V. D) 2.0 V. E) 4.0 V.

18. In an **ac** circuit, the electric field

- A) increases via the inverse square law.
B) changes magnitude and direction with time. C) is the same everywhere.
D) is nonexistent. E) none of the above.

19. The number of electrons delivered daily to an average Riyadh home by an average power utility is

- A) zero. B) 110. C) 220. D) billions of billions.
E) none of the above.

20. A **4.0 Ω** resistor is connected in parallel with a **6.0 Ω** resistor. This combination produces an equivalent resistance of?

- A) 4 Ω B) 2.4 Ω C) 5 Ω D) 5.5 Ω E) 10 Ω

21. A rock suspended by a weighing scale weighs **5 N** out of water and **3 N** when submerged in water. What is the buoyant force on the rock?

- A) 8 N. B) 2 N. C) 6 N. D) 5 N. E) 3 N.

22. A volume of air has a temperature of **0°C**. An equal volume of air that is twice as hot has a temperature of

- A) 0°C. B) 2°C. C) 273°C. D) 100°C. E) none of the above.

Part 2:

Please read each question carefully and write your answer in the space provided with the appropriate units. Each question is graded on a 5 points scale.

- P.1.** A bullet is fired straight up into the air with a velocity of **100 m/s**. Neglecting air resistance, find the distance traveled by the bullet at the end of **1 s**.

Answer_____

- P.2.** An electric heater is rated at **300 W** when used in a **110 V** circuit. The safety fuse in the circuit can handle **15 A** of current. How many heaters can be safely operated in the circuit?

Answer_____

- P.3.** A slice of bread contains about $4.19 \times 10^5 \text{ J}$ of energy. If the specific heat capacity of a person is $4.19 \times 10^3 \text{ J/kg}\cdot^\circ\text{C}$, by how many degrees Celsius would the temperature of a **70.0 kg** person increase if all the energy in the bread were converted to heat?

Answer_____

- P. 4.** Water flows at a speed of **15 m/s** through a pipe that has a radius of **0.40 m**. The water then flows through a smaller pipe at a speed of **45 m/s**. What is the radius of the smaller pipe?

Answer_____

- P. 5.** Two snowballs with masses of **0.40 kg** and **0.60 kg**, respectively, collide head-on and combine to form a single snowball. The initial speed for each is **15 m/s**. What is the velocity of the new combined snowball?

Answer _____

Some useful constants:

$$e^- = 1.60 \times 10^{-19} \text{ C}$$

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$g = 10 \text{ m/s}^2$$

$$k = (1/4\pi\epsilon_0) = 8.99 \times 10^9 \text{ N.m}^2/\text{C}^2$$

$$m_p = 1.67 \times 10^{-27} \text{ kg.}$$

$$\rho_{\text{water}} = 1 \text{ gm/cm}^3$$

$$c_{\text{water}} = 4190 \text{ J/ kg. K} = 1.0 \text{ cal/g.}^{\circ}\text{C} \qquad 1.0 \text{ cal} = 4.18 \text{ J}$$

$$L_{\text{fusion}} \text{ for water} = 334 \text{ J/g} = 80 \text{ cal/g}$$

$$L_{\text{vaporization}} \text{ for water} = 2256 \text{ J/g} = 540 \text{ cal/g}$$