XPERTSTEM Physics Sample Test Division 5 for Grade 11 & 12

1. **The kinetic energy of a car moving at constant velocity v is K. The velocity of the car changes to 2v. What is the new kinetic energy of the car?**

a. ¼ K

b. ½ K

c. 2 K

d. 4 K

2. **Which ONE of the following physical quantities represents the RATE OF CHANGE OF MOMENTUM of an object?**

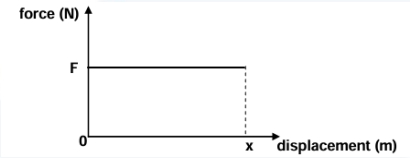
a. Force.

b. Kinetic energy.

c. Impulse.

d. Acceleration.

3. **The graph below represents a constant force F acting on an object over a displacement x. The force and displacement are in the same direction.**



Which ONE of the following statements can be deduced from the graph?

a. The gradient of the graph represents the work done by the force.

b. The gradient of the graph represents the change in kinetic energy of the object.

c. The area under the graph represents the net work done by the force.

d. The area under the graph represents the power dissipated by the force. pH

4. **Which ONE of the following is the main principle applied when measuring the rate of blood flow or the heartbeat of a foetus in the womb?**

a. Doppler effect

b. Photoelectric effect

c. Huygens' principle

d. Diffraction

5. **The pattern observed in single-slit diffraction is best explained by ...**

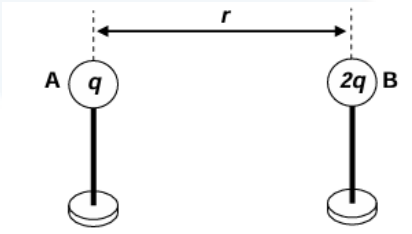
a. reflection.

b. Huygens' principle.

c. scattering.

d. Refraction

6. **The sketch below shows two small metal spheres, A and B, on insulated stands carrying charges of magnitude q and 2q respectively. The distance between the centres of the two spheres is r.**



Sphere A exerts a force of magnitude F on sphere B. What is the magnitude of the force that sphere B exerts on sphere A?

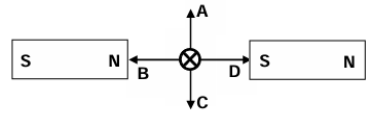
a. ½ F

b. F

c. 2F

d. 4F

7. The cross (Y) in the diagram below represents a conductor carrying conventional current INTO THE PAGE in the uniform field between the two bar magnets. The conductor is placed between the north (N) pole and south (S) pole of the magnets, as shown.



In which ONE of the directions A, B, C or D (all lying in the plane of the page) will this conductor experience a force?

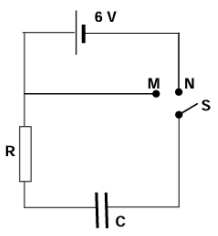
a. A

b. B

c. C

d. D

8. A 6 V battery, a resistor, a capacitor and a switch S are connected in a circuit as shown in the diagram below. Switch S can be closed at either position M or position N.



Switch S is initially at position N. After a while it is moved to position M.
Which ONE of the following statements is correct when the switch is moved to position M?

a. The capacitor discharges.

b. The capacitor charges.

c. The battery discharges.

d. The battery charges.

9. A 0.50 kg mass is attached to a string 1.0 m long and moves in a circle completing 1 revolution in 0.5 seconds. What is centripetal acceleration of the mass?

a. 160 m/s^2

b. 160 N

c. 157.9 m/s

d. 157.9 m/s^2

10. Calculate the amount of centripetal force it takes for a softball pitcher to rotate a ball with a velocity of 3.0 m/s if the ball weighs 0.12 kg and her arm is 0.65 meters long.

a. 0.38N

b. 0.55N

c. 1.23N

d. 1.66N

11. What is the frequency range of human hearing?

a. 20 hertz to 20 kilohertz

b. 2 hertz to 20 hertz

c. 20 hertz to 200 hertz

d. 2 hertz to 200 hertz

12. Which of the following types of waves causes particles in matter to move back and forth along the same direction in which the wave travels?

a. Compressional Waves

b. Electromagnetic Waves

c. Longitudinal Waves

d. Transverse Waves

13. In addition to magnifying the image of an object, a microscope inverts the image left to right. The image of the object observed through the microscope is also upside down. Looking through the eyepiece, you would therefore see the upside-down mirror image of the object under the microscope lens. What would the object below look like if observed through the microscope?

a. 

a. a

b. b

c. c

d. d

14. Which of these substances has the highest specific heat, requiring the most amount of heat energy to raise its temperature by 1°C?

a. iron

b. wood

c. oil

d. water

15. Which of these stars is hottest?

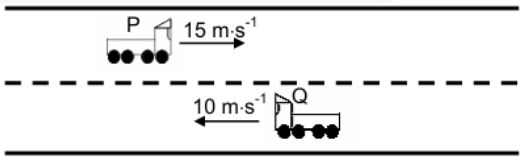
a. ARed Star

b. Yellow Star

c. Orange Star

d. Blue Star

16. The diagram below shows two trucks, P and Q, travelling in opposite directions along a straight level road. Truck P travels at 15 m·s-1 and truck Q travels at 10 $m \cdot s^{-1}$. A passenger on truck P will observe truck Q travelling at …



a. 5 $m \cdot s^{-1}$

b. 10 $m \cdot s^{-1}$

c. 15 $m \cdot s^{-1}$

d. 25 $m \cdot s^{-1}$

17. A closed system's internal energy is 30 Joules. Some heat is supplied to it, and it does 20 Joules of work. After this, the closed system's internal energy is 80 Joules. How many Joules of heat were added to the system?

a. 50

b. 60

c. 70

d. 80

18. The engine of a car does work, W, to increase the velocity of the car from 0 to v. The work done by the engine to increase the velocity from v to 2v, is …

a. W

b. 2W

c. 3W

d. 4W

19. The siren of a police car, travelling at a speed v, emits sound waves of frequency f.

Which ONE of the following best describes the frequency that will be observed by a passenger in a car following right behind the police car at a speed v?

a. Zero

b. Smaller than f

c. Equal to f

d. Greater than f

20. Which ONE of the following best describes the difference between laser light and fluorescent light?

a. Laser light consists of more frequencies than fluorescent light.

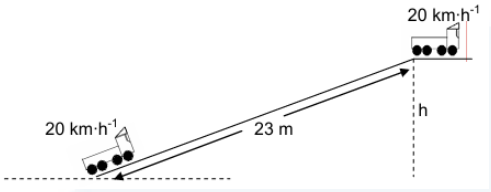
b. Laser light is coherent, monochromatic and collimated, while fluorescent light has none of these properties.

c. Laser light is coherent and collimated, while fluorescent light is monochromatic.

d. Fluorescent light is coherent and laser light is not.

The next TWO questions are based of the following:

A 10 000 kg truck travels up a straight inclined road of length 23 m at a constant speed of 20 km·h-1. The total work done by the engine of the truck to get there is 7 x 105 J. The work done to overcome friction is 8,5 x 104 J.



21. What is the height, h, reached by the truck at the top of the road?

a. 6,28 m

b. 8,26 m

c. 8,62 m

d. 6,82 m

22. What is the instantaneous power delivered by the engine of truck?

a. $1,7 \times 10^5$ W

b. $1,6 \times 10^3$ W

c. $1,6 \times 10^5$ W

d. $1,67 \times 10^3$ W

23. When a dolphin is 100 m from a rock, it emits ultrasound waves of frequency 250 kHz whilst swimming at 20 m·s-1 towards the rock. Assume that the speed of sound in water is 1 500 m·s^{-1}. What is the frequency of the sound waves detected by a detector on the rock?

a. 253,38 kHz

b. $258,38 \times 10^3$ Hz

c. $235,38 \times 10^3$ Hz

d. 235,83 kHz

24. Which system permits energy and matter to be exchanged with the surroundings?

a. Isolated

b. Open

c. Adiabatic

d. Closed

25. The units which can align to create a magnet are called.

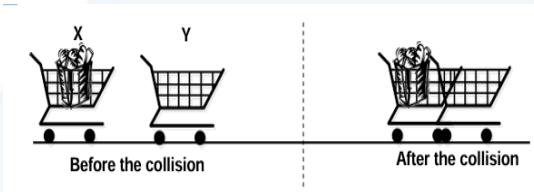
a. domains

b. magnetic units

c. molecules

d. electrons

26. Two shopping trolleys, X and Y, are both moving to the right along the same straight line. The mass of trolley Y is 12 kg and its kinetic energy is 37,5 J
Trolley X of mass 30 kg collides with trolley Y and they stick together on impact. After the collision, the combined speed of the trolleys is 3,2 $m \cdot s^{-1}$. (Ignore the effects of friction.)



Calculate the speed of trolley X before the collision.

a. 2,5 $m \cdot s^{-1}$

b. 4,38 $m \cdot s^{-1}$

c. 3,48 $m \cdot s^{-1}$

d. 5,25 $m \cdot s^{-1}$

27. The operation of a mechanical seismograph depends on the property of_____.

a. gravity

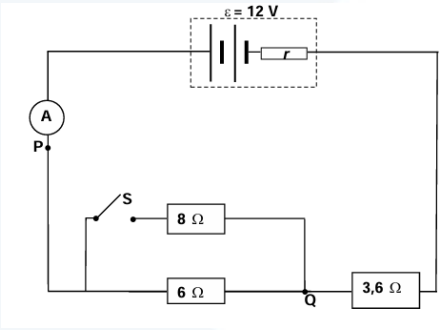
b. inertia

c. friction

d. heat energy

The following THREE questions are based on the diagram below:

The circuit diagram below represents a combination of resistors in series and parallel. The battery has an emf of 12 V and an unknown internal resistance r.



With switch S OPEN, ammeter A gives a reading of 1,2 A.

28. Calculate the total resistance of the circuit.

a. 10 Ω

b. 13 Ω

c. 11 Ω

d. 12 Ω

29. Calculate the internal resistance of the battery.

a. 0.9 Ω

b. 0.4 Ω

c. 4 Ω

d. 3 Ω

30. Calculate the energy dissipated in the 6 Ω resistor in 3 minutes.

a. $1{,}56 \times 10^3$J

b. $1{,}65 \times 10^3$J

c. $1{,}63 \times 10^3$J

d. $1{,}59 \times 10^3$J

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