

*KSU*

*Phys 109*

*Final Exam*

*1445 Hijri- Second Term*

*Mr. Abdullah Mohamed*

**@Chem31Phys**

خاص بالمشاركين فقط

AL NOJOUM ACADEMY

Final Exam

Academic Year 1445 Hijri- Second Term

Exam Information

معلومات الامتحان

|               |                        |                |
|---------------|------------------------|----------------|
| Course name   | General Physics        | اسم المقرر     |
| Course Code   | PHYS 109               | رمز المقرر     |
| Exam Date     | 28/05/2024 20/11/1445  | تاريخ الامتحان |
| Exam Time     | 1:00 to 4:00 pm        | وقت الامتحان   |
| Exam Duration | 3.0 hours<br>3.0 ساعات | مدة الامتحان   |

If needed, use:

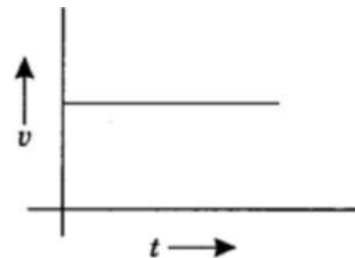
$$g = 9.8 \text{ m.s}^{-2}$$
$$\rho_{\text{water}} = 10^3 \text{ kg/m}^3, e = 1.6 \times 10^{-19} \text{ C}$$
$$k = 1/4\pi\epsilon_0 = 9 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$$

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1. The given velocity versus time graph represents an object



- A) in uniform motion.      B) at rest.      C) in a circular motion.      D) moving with uniform acceleration.      E) not given.

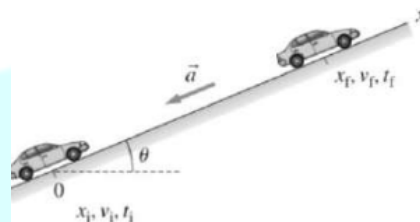
2. A car travels in a straight line with an initial velocity of 4 m/s and an acceleration of 2 m/s<sup>2</sup>. The distance traveled in 4 s is (in meters):

- A) 36      B) 40      C) 24      D) 28      E) 32

3. Consider the vectors  $A = 3i - 2j$ ,  $B = -i - 4j$  and  $C = A - B$ ; the magnitude and direction of the vector C are:

- A) 2.27, 13.3°      B) 3.47, 18.3°      C) 4.47, 26.6°      D) 5.27, 29.3°      E) 17.2, 69.3°

4. A taxi traveling at 30 m/s runs out of gas while **traveling up** a frictionless ramp tilted at angle 5°. How far will it get before it stops and starts going back down?

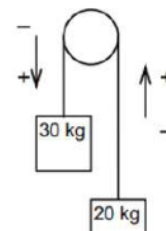


- A) 17.60 m      B) 526.9 m      C) 91.80 m      D) 35.12 m      E) 14.70 km

5. A 5 kg object rests on a plane inclined 30° with the horizontal. The component of the weight force that is parallel to the incline has a magnitude of (in N):

- A) 4.33      B) 15.0      C) 24.5      D) 42.4      E) 50.0

6. A 30 kg mass is connected over a pulley with a 20 kg mass. The resulting acceleration in m/s<sup>2</sup> when the masses are released is:



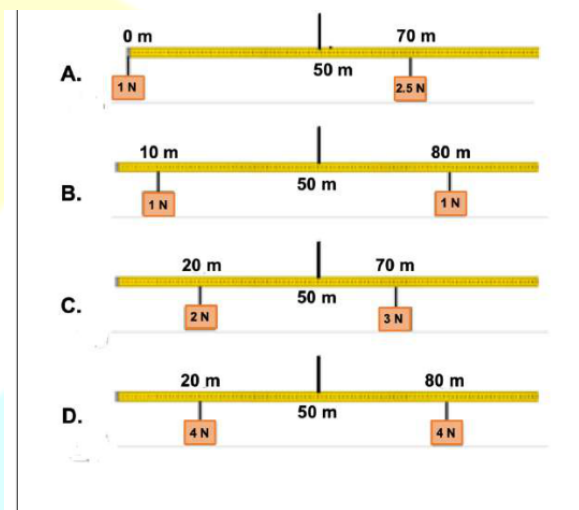
- A) - 2.3      B) +5.5      C) +6.0      D) - 0.5      E) +1.96

7. A man is standing in an elevator on a scale calibrated in Newtons. Suppose the elevator accelerates upward at  $3.0 \text{ m/s}^2$ . If the scale reads 1024 N, the man's mass in kg is:  
 A) 150                      B) 80                      C) 340                      D) 40                      E) 160

8. A 4.0 kg box is at rest on a table. The static friction coefficient between the box and table is 0.30, and the kinetic friction coefficient is 0.10. Then, a 25 N horizontal force is applied to the box.  
 The magnitude of the box's acceleration in  $\text{m/s}^2$  is:  
 A) 0                      B) 21                      C) 3.3                      D) 10                      E) 5.3

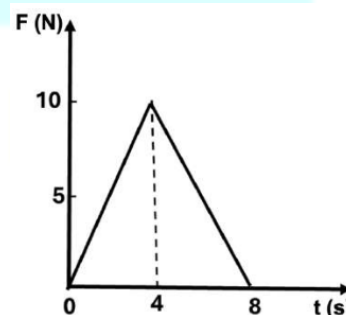
9. The magnitude of a torque will be zero if the angle between the force and the radial line is:  
 A)  $45^\circ$                       B)  $90^\circ$                       C)  $270^\circ$                       D)  $120^\circ$                       E)  $0^\circ$

10. In which of the following examples is the stick unbalanced?



A) A                      B) B                      C) C                      D) D                      E) both A & C

11. A ball of mass 2.0 kg, initially at rest, is acted on by a force  $F$  which varies with time  $t$  as shown by the graph. After 8.0 s, the velocity of the ball (in  $\text{m/s}$ ) is:

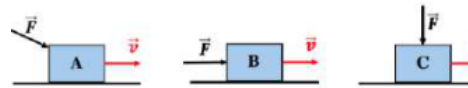


A) 20                      B) 40                      C) 60                      D) 80                      E) 120

12. For the two physical quantities, impulse and force, which one of the following is correct?

- A) Impulse is a scalar and force is a scalar.    B) Impulse is a scalar and force is a vector.    C) Impulse is a vector and force is a scalar.    D) Impulse is a vector and force is a vector.    E) None.
- 

13. The same force  $F$  pushes in three different directions on a box moving with a velocity  $v$ , as the drawings show.



Rank the work done by the force  $F$  in ascending order (smallest first):

- A) (A, B, C)    B) (A, C, B)    C) (B, A, C)    D) (C, B, A)    E) (C, A, B)
- 

14. The energy required to accelerate a 2 kg block from rest to a final speed of 5 m/s (in J) is:

- A) 2.5    B) 10    C) 5    D) 25    E) 30
- 

15. The power output, in Watt, for a 60.0 kg woman who runs upstairs 3.00 m high in 3.50 s, starting from rest and having a final speed of 2.00 m/s is:

- A) 50    B) 120    C) 538    D) 799    E) 1050
- 

16. A lake has a depth of 15 m and the density of water is  $1030 \text{ kg/m}^3$ . If the atmospheric pressure at the surface of the lake is  $1.0 \times 10^5 \text{ Pa}$ .

The total pressure on a fish at the bottom of the lake (in Pa) is equal to:

- A)  $1.5 \times 10^5$     B)  $2.0 \times 10^5$     C)  $1.0 \times 10^5$     D)  $2.5 \times 10^5$     E)  $3.0 \times 10^5$
- 

17. A pump pushes water at a speed of 14 m/s from the end of a pipe with a cross-sectional area of  $10 \text{ cm}^2$  into a cubic-shaped tank with a volume of  $3 \text{ m}^3$ .

The time required to fill the tank (in s) is:

- A) 2.14    B) 214    C) 21.4    D) 0.214    E) 90
- 

18. A liquid is pushed to move smoothly through a tube whose first end has an area of  $2 \text{ cm}^2$  and whose second end has an area of  $4 \text{ cm}^2$ .

If its speed at the first end is 16 m/s, then its speed at the second end (in m/s) is:

- A) 8    B) 16    C) 108    D) 32    E) 64
-

19. A beam of light traveling in air is incident on a slab of transparent material. The incident beam makes an angle of  $40.0^\circ$  with the normal and the refracted beam makes an angle of  $26.0^\circ$  with the normal. If we assume that the index of refraction of the air is  $n_{\text{air}} = 1.00$ , then the index of refraction of this material is:

- A) 0.284      B) 0.682      C) 1.13      D) 1.47      E) 1.72
- 

20. A converging lens of focal length 10.0 cm forms an image of an object placed 30.0 cm from the lens. Then the image distance (in cm) is:

- A) 15.0      B) -15      C) 20.0      D) 10.0      E) -10.0
- 

21. A diverging lens with focal length of 25 cm is placed 50 cm from an object and an image is formed at 15 cm. The magnification of the image is:

- A) 1.0      B) 2.0      C) -1.0      D) 0.6      E) 0.3
- 

22. Two point charges,  $Q_1$  and  $Q_2$ , are separated by a distance  $R$ .

If the magnitude of each charge is doubled and their separation is halved, the electrical force that each charge exerts on the other:

- A) increases by a factor of 16.  
B) increases by a factor of 8.  
C) increases by a factor of 2.  
D) decreases by a factor of 8.  
E) decreases by a factor of 16.
- 

23. The electric field at a point 2.8 cm from a small charged object points outwards from the object and has a strength of 180 kN/C. The object's charge  $q$  (in nC) is about:

- A) -16      B) +16      C) -17      D) +18      E) -19
- 

24. A parallel plate capacitor is filled with a 1.0 mm thick rutile dielectric layer.

The permittivity constant of the rutile is  $\epsilon_{\text{rutile}} = \kappa\epsilon_0 = 8.85 \times 10^{-10} \text{ C}^2/(\text{N}\cdot\text{m})$ .

If the area of the capacitor plates is  $1.0 \text{ cm}^2$  then its capacitance is:

- A)  $8.85 \times 10^{-10} \text{ F}$     B)  $8.85 \times 10^{-2} \text{ nF}$     C)  $8.85 \times 10^{-2} \text{ pF}$     D)  $8.85 \times 10^{-2} \text{ }\mu\text{F}$     E)  $8.85 \times 10^{-12} \text{ F}$
- 

25. A 15 nC charged particle moves from point A, where the electric potential is 300 V, to point B, where the electric potential is -200 V.

By how much does the particle's electric potential energy change?

- A)  $-7.5 \text{ }\mu\text{J}$       B)  $7.5 \text{ }\mu\text{J}$       C)  $-7.5 \text{ mJ}$       D)  $7.5 \text{ nJ}$       E)  $-7.5 \text{ nJ}$
-

26. If the radius of a resistance wire is halved, then its resistance will be

- A) doubled.    B) halved.    C) tripled.    D) quadrupled.    E) still constant.
- 

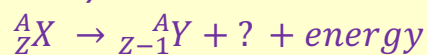
27. The resistivity of a copper wire carrying 5 A current is  $1.7 \times 10^{-8} \Omega \cdot m$ . If the wire is 22 m long and the radius of its cross-sectional area is 0.5 mm, then its resistance (in  $\Omega$ ) is:

- A) 0.48    B)  $4.8 \times 10^{-7}$     C)  $2.8 \times 10^{-7}$     D)  $4.2 \times 10^{-18}$     E)  $2.4 \times 10^{-8}$
- 

28. A 200 g sample of radioactive nuclei X is placed in a sealed box. The half-life of this isotope is 2 days. After 4 days, the remaining mass of this sample in the box is:

- A) Unchanged.    B) 50 g    C) 25 g    D) 0    E) not enough information to know.
- 

29. In the following radioactive decay



The missing particle (or ray) in the decay equation is:

- A)  $\alpha$     B)  $e^+$     C)  $e^-$     D)  $\gamma$     E) No missing particles or ray.
- 

30. The number of neutrons in the isotope  ${}^{14}_6C$  is:

- A) 6    B) 7    C) 8    D) 14    E) 20
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