Assiut University
Faculty of Science
Physics Department

General Physics 1 (P100)
2nd semester 2021-2022
Final Exam (60 Marks)

Exam date: Wednesday, 08/06/2022
Exam Time: 2 hours

"يتم طمس(تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

First part (I): (50 Marks)

1st Question: (50 Marks)

1. In the CGS system, what are the fundamental units?

   A) Newton, Centimeter, second
   B) Kilogram, meter, Second
   C) Gram, Centimeter, minute
   D) Gram, centimeter, Second

2. When is the average velocity of an object equal to the instantaneous velocity?

   A) only when the velocity is constant.
   B) always.
   C) never.
   D) only when the velocity is increasing at a constant rate

3. A polar bear starts at the North Pole. It travels 1.0 km south, then 1.0 km east, then 1.0 km north, then 1.0 km west to return to its starting point. This trip takes 45 min. What was the bear's average velocity?

   A) 5.3 km/h
   B) 0.09 km/h
   C) 4.5 km/h
   D) Zero km/h

4. Two displacement vectors have magnitudes of 5.0 m and 7.0 m, respectively. When these two vectors are added, the magnitude of the sum?

   A) could be as small as 2.0 m, or as large as 12 m
   B) is 2.0 m
   C) is 12 m.
   D) is larger than 12 m

5. What is the conversion factor between km/h^2 and m/s^2?

A) 7.72×10^{-6} m/s^2
B) 2.78×10^{-2} m/s^2
C) 1.30×10^{4} m/s^2
D) 3.60×10^{4} m/s^2

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6. An object moving in the +x axis experiences an acceleration of 2.0 m/s^2. This means the object is
A) traveling at 2.0 m in every second.
B) traveling at 2.0 m/s in every second.
C) changing its velocity by 2.0 m/s.
D) increasing its velocity by 2.0 m/s in every second.

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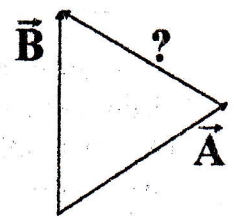
7. In the diagram shown, the unknown vector is



A) $\vec{A} + \vec{B}$
B) $\vec{A} - \vec{B}$
C) $-\vec{A} + \vec{B}$
D) $\vec{A} \times \vec{B}$

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8. A ball is thrown with a velocity of 20 m/s at an angle of 60° above the horizontal. What is the horizontal component of its instantaneous velocity at the exact top of its trajectory?
A) 17 m/s.
B) 20 m/s.
C) 10 m/s.
D) Zero m/s.

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9. A rock is thrown straight up with an initial velocity of 24.5 m/s. What maximum height will the rock reach before starting to fall downward?

A) 9.80 m.
B) 30.6 m.
C) 19.6 m.
D) 24.5 m.

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10. Which of the following quantities has the same dimensions as kinetic energy, $1/2mv^2$?

A) ma
B) mvx
C) mvt
D) mgh

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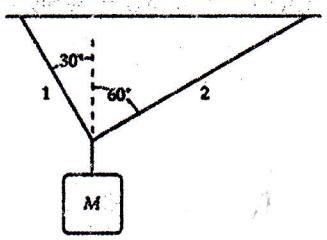
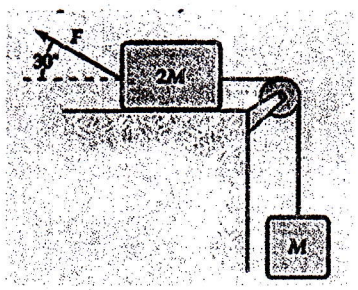
11. If M = 6.0 kg, what is the tension in string 1?



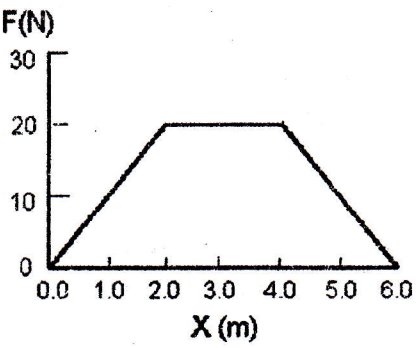
A) 34 N
B) 29 N
C) 44 N
D) 51 N

12. If F = 40 N and M = 2.0 kg, what is the magnitude of the acceleration of the suspended object? All surfaces are frictionless.



A) 1.2 m/s^2
B) 2.0 m/s^2
C) 1.5 m/s^2
D) 2.5 m/s^2

13. A force moves an object in the direction of the force. The graph below shows the force versus the object's position. Find the work done when the object moves from 0 to 2.0 m.?



A) 40 J.
B) 20 J.
C) 80 J.
D) 60 J.

14. An Olympic athlete throws a javelin at four different angles above the horizontal, each with the same speed: 30 °, 40 °, 60 °, and 80 °. Which two throws cause the javelin to land the same distance away?
A) 30° and 80°.
B) 40 ° and 60 °
C) 30 ° and 60 °
D) 40 ° and 80 °

15. If the only forces acting on a 2.0 kg mass are F1 = (3i – 8j) N and F2 = (5i + 3j) N, what is the magnitude of the acceleration of the particle?
A) 1.5 m/s^2.
B) 6.5 m/s^2.
C) 4.7 m/s^2.
D) 9.4 m/s^2.

16. Which expression is dimensionally consistent with an expression that would yield a value for t^{-1}?
A) v^2/x
B) v/x
C) x/t
D) $v^2.t$

17. A projectile is launched with an initial velocity of 60.0 m/s at an angle of 30.0° above the horizontal. What is the maximum height reached by the projectile?

A) 23 m.
B) 46 m.
C) 69 m.
D) 92 m.

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18. A plane flying horizontally at a speed of 50.0 m/s and at an elevation of 160 m drops a package. Two seconds later it drops a second package. How far apart will the two packages land on the ground?

A) 100 m
B) 162 m
C) 177 m
D) 283 m

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19. A 30 N box is pulled 6.0 m up along a 37° inclined plane. What is the work done by the weight of the box?

A) -2.2×10^2 J
B) -1.8×10^2 J
C) -1.1×10^2J
D) -0.8×10^2 J

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20. A 50 N object was lifted 2.0 m vertically and is being held there. How much work is being done in holding the box in this position?

A) 120 J
B) Zero J
C) 50 J
D) 100 J

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21. A sports car of mass 1000 kg can accelerate from rest to 27 m/s in 7.0 s. What is the average forward force on the car??

A) 2.6×10^2 N
B) 2.7×10^4 N
C) 3.9×10^3 N
D) 1.9×10^5 N

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22. A net force F accelerates a mass m with an acceleration a. If the same net force is applied to mass 2m, then the acceleration will be

A) 4a
B) a/2
C) a/4
D) 2a

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23. Under what condition is average velocity equal to the average of the object's initial and final velocity?
A) The acceleration must be constantly changing.
B) This can only occur if there is no acceleration.
C) The acceleration must be constant.
D) none of the given answers

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24. A person of weight 480 N stands on a scale in an elevator. What will the scale be reading when the elevator is accelerating downward at 4.00 m/s^2?
A) 196 N
B) 284 N
C) 676 N
D) 480 N

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25. A pendulum of length 2.00 m and mass 0.500 kg is released from rest when the cord makes an angle of 30° with the vertical. the speed of the sphere at its lowest point is
A) 2.29 m/s
B) 2.0 m/s
C) Zero m/s
D) 3.2 m/s

Second Part (II) Oral Exam **(10 Marks)**

2nd Question: State True or False on the following **(10 Marks)**

26. Distance is one of the vector quantities.

a. True b. False

27. A constant net force acts on an object. Describe the motion of the object constant velocity

a. True b. False

28. It is possible for an object moving with a constant speed to accelerate.

a. True b. False

29. A vector cannot have zero magnitude if one of its components is not zero.

a. True b. False

30. the correct unit of work expressed in SI units is kg m^2/s.

a. True b. False

End of Exam

Best wishes

Dr. Abdelnaby M. Elshahawy

Assiut University
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First part (I): **(50 Marks)**

1st Question: **(50 Marks)**

1. Object A has a charge of +4 C and object B has a charge of −8 C. Which is true?

   A) $\vec{F}_{BA} = 2\vec{F}_{AB}$
   B) $\vec{F}_{BA} = -\vec{F}_{AB}$
   C) $\vec{F}_{BA} = -2\vec{F}_{AB}$
   D) $\vec{F}_{BA} = \frac{1}{2}\vec{F}_{AB}$

2. Consider two copper wires. One has twice the length of the other. How do the resistivities of these two wires compare?

   A) Both wires have the same resistivity.
   B) The longer wire has twice the resistivity of the shorter wire.
   C) The longer wire has four times the resistivity of the shorter wire.
   D) none of the given answers

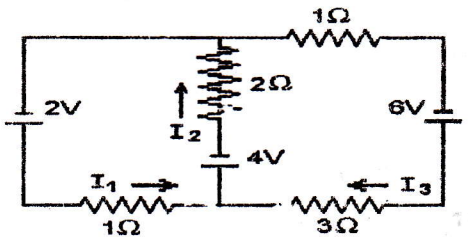
3. A parallel plate capacitor consists of two circular plates of radius 10cm that are spaced 2mm apart with air between the plates. The potential difference between the plates is 600 V. The amount of charge stored on each plate is

   A) 140 pC
   B) 26 nC
   C) 0.83μC
   D) 83 nC

4. What current is flowing if 0.67 C of charge pass a point in 0.30 s?

   A) 2.2 A
   B) 0.67 A
   C) 0.30 A
   D) 0.20 A

5. Which of the equations here is valid for the circuit shown?



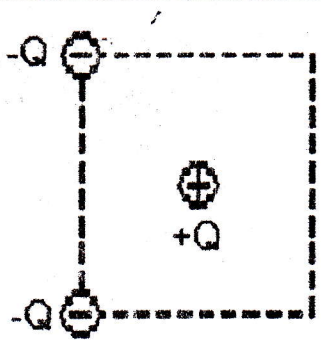
A) $2 - I_1 - 2I_2 = 0$
B) $2 - 2I_1 - 2I_2 - 4I_3 = 0$
C) $4 - I_1 + 4I_3 = 0$
D) $-2 - I_1 - 2I_2 = 0$

6. For a proton moving in the direction of the electric field
A) its potential energy increases and its electric potential decreases.
B) its potential energy decreases and its electric potential increases.
C) its potential energy increases and its electric potential increases.
D) its potential energy decreases and its electric potential decreases.

7. A platinum wire is used to determine the melting point of indium. The resistance of the platinum wire is 2.000 Ω at 20°C and increases to 3.072 Ω as indium starts to melt. What is the melting point of indium? (The temperature coefficient of resistivity for platinum is $3.9 \times 10^{-3}/C°$.)?
A) 117°C
B) 137 °C
C) 157 °C
D) 351 °C

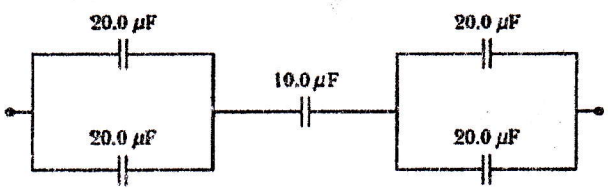
8. A vertical wire carries a current straight down. To the east of this wire, the magnetic field points?
A) north.
B) east.
C) south.
D) west.

9. A point charge of +Q is placed at the center of a square, and a second point charge of -Q is placed at the upper-left corner. It is observed that an electrostatic force of 2.0 N acts on the positive charge at the center. What is the magnitude of the force that acts on the center charge if a third charge of -Q is placed at the lower-left corner?



A) zero.
B) 2.8 N.
C) 4.0 N.
D) 5.3 N.

10. Each capacitor in the combination shown in Figure below has a breakdown voltage of 15.0V. What is the breakdown voltage of the combination?



A) 22.5 V
B) 20.2 V
C) 15.6 V
D) 30.7 V

11. Two charges are separated by a distance d and exert mutual attractive forces of F on each other. If the charges are separated by a distance of d/3, what are the new mutual forces??

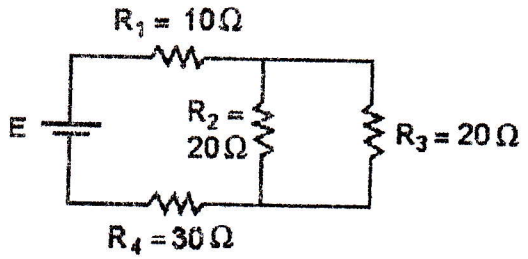
A) F/9
B) F/3
C) 3F
D) 9F

12. You move a charge q from $r_i = 20$ cm to $r_f = 40$ cm from a fixed charge $Q_i = 10$ nC. What is the difference in potential for these two positions?

A) -2.2×10^2 V
B) -1.7×10^3 V
C) -2.2×10^4 V
D) -1.7×10^2 V

13. A 3.0-W resistor is connected in parallel with a 6.0-W resistor. This combination is connected in series with a 4.0-W resistor. The resistors are connected to a 12-volt battery. How much power is dissipated in the 3.0-W resistor?

A) 2.7 W.
B) 5.3 W.
C) 6.0 W.
D) 12 W.



14. The SI unit of magnetic field is the.....

A) weber.
B) gauss
C) tesla
D) Lorentz

15. Two point charges each have a value of 30.0 mC and are separated by a distance of 4.00 cm. What is the electric field midway between the two charges? ($k_e = 8.99 \times 10^9$ N·m^2/C^2)?

A) 40.5×10^7 N/C.
B) 20.3×10^7 N/C.
C) 10.1×10^7 N/C.
D) zero.

16. A small charged ball is accelerated from rest to a speed v by a 500 V potential difference. If the potential difference is changed to 2000 V, what will the new speed of the ball be?

A) v
B) 2v
C) 4v
D) 16v

17. . . proton, initially at rest, is accelerated through an electric potential difference of 500 V. What is the kinetic energy of the proton?

A) 500 J.
B) 8.0×10^{-17} J.
C) 1.6×10^{-19} J.
D) zero.

18. Two uniform electric fields are superimposed. The first electric field is $E_1 = (14\ \text{N/C})\hat{\imath}$. The second electric field is $E_2 = (7.0\ \text{N/C})\hat{\jmath}$. With respect to the positive x-axis, at which angle will a positive test charge accelerate in this combined field?

A) 27°
B) 54°
C) 90°
D) 108°

19. It takes 50 J of energy to move 10 C of charge from point A to point B. What is the potential difference between points A and B?

A) 500 V
B) 50 V
C) 5.0 V
D) 0.50 V

20. The maximum torque on a current carrying loop occurs when the angle between the loop's magnetic moment and the magnetic field vector is?

A) 0°
B) 90°
C) 180°
D) 45°

21. A capacitor with neoprene rubber as the dielectric stores 0.185 mJ of energy with a voltage of 50 V across the plates. If the area of the plates is 500 cm^2, what is the plate separation (k= 6.7)?

A) 20 μm
B) 20 m
C) 80 μm
D) 80 m

22. A proton which moves with a of 4×10^4 m/s horizontally enters a region where a uniform magnetic field of 0.13 T experiences a force of what magnitude? ($e = 1.6 \times 10^{-19}$ C)

A) 1.4×10^{-16} N
B) 8.3×10^{-16} N
C) 5.2×10^{-16} N
D) zero

23. At double the distance from a long current-carrying wire, the strength of the magnetic field produced by that wire decreases to
A) 1/8 of its original value.
B) 1/4 of its original value.
C) 1/2 of its original value.
D) none of the given answers

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24. A 2 m wire segment carrying a current of 0.6 A oriented parallel to a uniform magnetic field of 0.5 T experiences a force of what magnitude?
A) 6.7 N
B) 0.3 N
C) 0.15 N
D) zero

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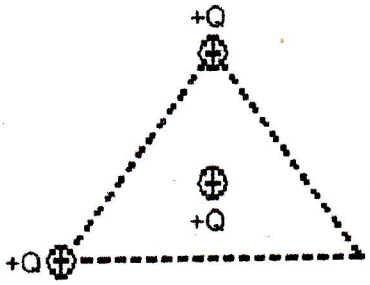
25. A point charge of +Q is placed at the centroid of an equilateral triangle. When a second charge of +Q is placed at one of the triangle's vertices, an electrostatic force of 4.0 N acts on it. What is the magnitude of the force that acts on the center charge due to a third charge of +Q placed at one of the other vertices??
A) 4.0 N
B) 16.0 N
C) 8.0 N
D) zero



Second Part (II) Oral Exam **(10 Marks)**

2nd Question: State True or False on the following **(10 Marks)**

26. One joule per coulomb is a farad.

a. True b. False

27. The direction of convention current is taken to be the direction that negative charges would flow.

a. True b. False

28. When resistors are connected in series, the current flowing in each is the same.

a. True b. False

29. When a current carrying wire is in your right hand, thumb in the direction of the current, your fingers point in the direction of the magnetic field lines.

a. True b. False

30. An equipotential surface must be parallel to the electric field at any point.

a. True b. False

End of Exam
Best wishes
Dr. Abdelnaby M. Elshahawy
Dr. Mohaned M. M. Mohammed