Assiut University
Faculty of Science
Physics Department
Course Name: General Physics 2 (P105)
Date: June 1, 2015

Semester: Spring 2015

Exam: Final
Time allowed: 2 Hours
Marks: 50 Marks

Useful constants: $e = 1.6\times10^{-19}C, m_e = 9.1\times10^{-31}kg, m_p = 1.67\times10^{-27}kg, k = 9\times10^{9}\frac{Nm^2}{C^2}, \varepsilon_o = 8.85\times10^{-12}\frac{F}{m}$ *and* $\mu_o = 4\pi\times10^{-7}\frac{N}{A^2}$

ANSWER ALL THE FOLLOWING QUESTIONS

Question I: **(20 Marks, 2 per each)**

Circle the correct answer for all of the following TEN multiple-choice questions.

1. Object A has a charge of $+2\ \mu C$, and object B has a charge of $+6\ \mu C$. Which statement is true about the electric forces on the objects?

(a) $F_{AB} = -3F_{BA}$ (b) $F_{AB} = -F_{BA}$ (c) $F_{AB} = F_{BA}$ (d) $F_{AB} = 3F_{BA}$

2. Which of the following expressions represents Gauss' Law?

(a) $\oint E.dA = \frac{Q}{\varepsilon_o}$ (b) $\int E.dA = 0$ (c) $\int E.dA = \frac{Q_{inside}}{\varepsilon_o}$ (d) $\oint E.dA = \frac{Q_{inside}}{\varepsilon_o}$

3. Which of the following expressions represent the electric potential of two negative charges Q and q, at a distance r from each of them?

(a) $\frac{kQq}{r}$ (b) $\frac{k(Q+q)}{r}$ (c) $-\frac{k(Q+q)}{r}$ (d) $\frac{k(q-Q)}{r}$

4. In a certain region of space, the electric field is zero. From this we can conclude that the electric potential in this region is:

(a) Zero (b) Constant (c) Positive (d) Negative

5. The capacitance of a capacitor depends on:

(a) Dimensions of the capacitor.
(b) Applied voltage on the capacitor.
(c) Charge on the capacitor.
(d) b and c.

6. In a region of uniform electric field E, a charged particle experiences an acceleration a. If a second particle with twice the charge and twice the mass of the first enters that same region, it will experience an acceleration of:

(a) $0.25\ a$ (b) a (c) $0.5\ a$ (d) $2.0\ a$

(٢)

7. A cylindrical wire has a radius r and length ℓ. If both r and ℓ are doubled, the resistance of the wire:

(a) Increase (b) Decrease (c) Remain the same (d) None of these

8. A charged particle is moving perpendicular to a magnetic field in a circle with a radius r. The magnitude of the magnetic field is increased. Compared to the initial radius of the circular path, the radius of the new path is:

(a) Smaller (b) Larger (c) Equal in size (d) None of these

9. In using Kirchhoff's rules, you generally assign a separate unknown current to each:

(a) Resistor in the circuit (b) Loop in the circuit (c) Branch in the circuit (d) Battery in the circuit

10. A unit that can express magnetic flux is:

(a) $N.m^2/C$ (b) V.m (c) T.m (d) N.m/Amp.

Question II: (30 Marks, 6 per each)

Solve ALL the following FIVE problems.

Problem 1

A flat sheet of paper measuring $22\ cm \times 28\ cm$ is placed in a uniform electric field of 100 N/C. What is the flux through the paper if the paper makes an angle 90^o with the electric field? What is the flux through the paper if the paper makes an angle of 30^o.

Problem 2

A resistance thermometer, which measures temperature by measuring the change in resistance of a conductor, is made from platinum and has a resistance of 50 Ω at 20 ^{o}C. When immersed in a vessel containing melting indium, its resistance increases to 76.8 Ω. Calculate the melting point of indium. For platinum $\alpha = 3.9\times10^{-3}{}^{o}C^{-1}$.

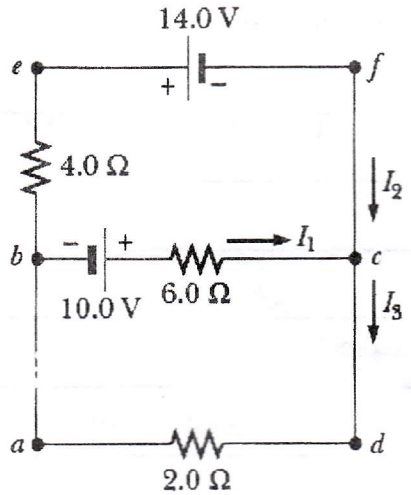
Problem 3

In an experiment designed to measure the magnitude of a uniform magnetic field, electrons are accelerated from rest through a potential difference of 350 V. The electrons travel along a curved path of radius 7.5 cm in a uniform magnetic field perpendicular to the velocity of the electron. What is the magnitude of the field?

(2)

Problem 4

Find the currents I_1, I_2, and I_3 in the circuit shown below.



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Problem 5

A plane loop of wire of area $A = 5\ \text{cm}^2$ is placed in a region where the magnetic field is perpendicular to the plane of the loop. The magnetic field B varies with time according to $B = 3t - 2t^2$. Find the induced emf at $t = 4\ s$.

End of the Exam.....*Good Luck*

Dr. Hesham Fares, Dr. Mohamed Omer, and Dr. Samar Moustafa

Assiut University		Term: Spring 2014 – 2015
Faculty of Science		Date: June 1st, 2015
Department of Physics		Course: Physics (1) (P100)
Final Exam: 50 Marks		Time: 2 hours

Constants: $g = 9.8\ m/s^2$

ANSWER ALL THE FOLLOWING QUESTIONS

Question I: **(20 Marks, 2 per each)**

Circle the correct answer for all of the following TEN multiple-choice questions.

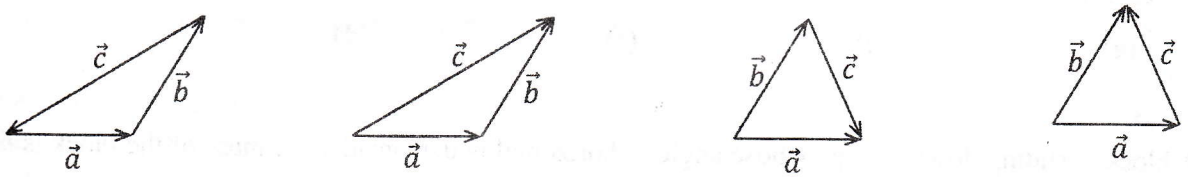
1. During a short interval of time the speed v in m/s of an automobile is given by $v = at^2 + bt^3$, where the time t is in seconds. The units of a and b are respectively:

(a) $m.\ s^2$; $m.\ s^4$ **(b)** s^3/m ; s^4/m **(c)** m/s^2 ; m/s^3 **(d)** m/s^3 ; m/s^4

2. If a car is travelling eastward and speeding up, what is the direction of the acceleration of the car?

(a) westward **(b)** eastward **(c)** downward **(d)** zero

3. The vectors $\vec{a}$, $\vec{b}$, and $\vec{c}$ are related by $\vec{c} = \vec{b} - \vec{a}$. Which diagram below illustrates this relationship?



(a) **(b)** **(c)** **(d)**

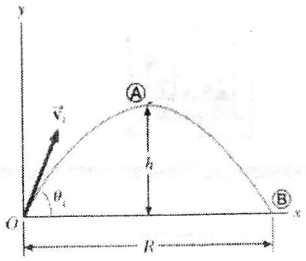
4. A ball is thrown upward. While the ball is in free fall, its acceleration:

(a) increases **(b)** decrease **(c)** decrease and then increase **(d)** remains the same

5. If A = [15, 80°] and B = 12i – 16j, what is the magnitude of A – B?

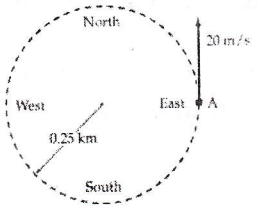
(a) 15 **(b)** 35 **(c)** 32 **(d)** 23

6. At which point of trajectory of a projectile, the vertical component of velocity (v_y) is zero?



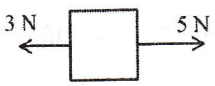
(a) point A **(b)** point B **(c)** points A and B **(d)** points O and B

7. A car travels counterclockwise around a flat circle of radius 0.25 km at a constant speed of 20 m/s. When the car is at point A as shown in the figure, what is the car's acceleration?

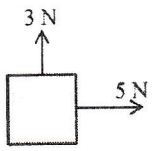


(a) 1.6 m/s^2, north **(b)** 1.6 m/s^2, west **(c)** 1.6 m/s^2, east **(d)** 1.6 m/s^2, south

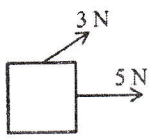
8. Two forces, one with a magnitude of 3N and the other with a magnitude of 5N, are applied to an object. For which orientations of the forces shown in the diagrams is the magnitude of the acceleration of the object the least?



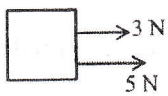
(a)



(b)



(c)

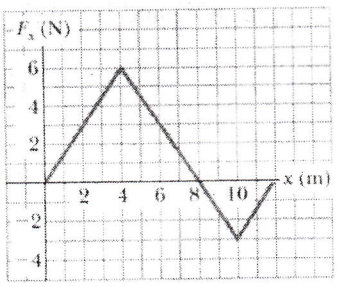


(d)

9. A block is sliding down a slope whose angle to horizontal is θ. Consider the mass of the block is m and the friction coefficient is μ_k. The acceleration of the block depends on:

(a) m and μ_k only.
(b) m and θ only.
(c) θ and μ_k only.
(d) m, μ_k, and θ.

10. The force acting on a particle varies as shown in figure below. The work done by the force on the particle as it moves (a) from $x = 0$ to $x = 10$ m is:



(a) 24 J
(b) −3 J
(c) 21 J
(d) 60 J

Question II: **(30 Marks, 7.5 per each)**

Solve only FOUR of the following five problems

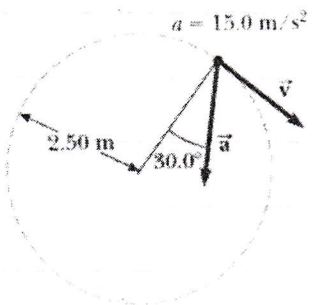
Problem 1

A jet lands on an aircraft carrier at 140 mi/h (≈ 63 m/s).

(a) What is its acceleration (assumed constant) if it stops in 2 s?
(b) What is the displacement of plane while it is stopping?

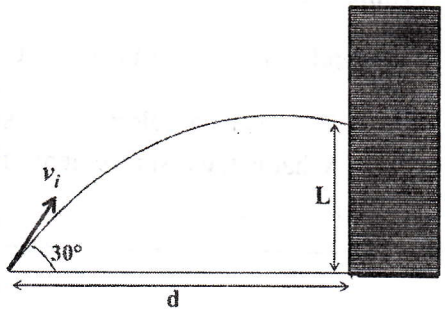
Problem 2

This figure represents the total acceleration of a particle moving clockwise in a circle of radius 2.5 m at a certain instant of time. At this instant, find
(a) the radial acceleration,
(b) the speed of the particle
(c) its tangential acceleration.



Problem 3

A firefighter $d = 50$ m away from a burning building directs a stream of water from a fire hose at an angle of 30° above the horizontal as shown below. If the speed of the stream is 40 m/s, at what height (L) will the water strike the building?



Problem 4

A hockey puck on a frozen pond is given an initial speed of 25 m/s. If the puck always remains on the ice and slides 120 m before coming to rest, determine the coefficient of kinetic friction between the puck and ice.

Problem 5

A 15 kg block initially at rest is pulled to the right along a horizontal, frictionless surface by a 70 N force acting at 20° above the horizontal. The block is displaced 5 m.

(a) Find the work done on the block by the 70 N force.
(b) Find the block's speed after it has moved 5 m.
(c) Find the acceleration of the block.

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End of the Exam**.....*****Good Luck***