

آموزشگاه علمی میرابی

MEC

Mirabi Educational Center

# جزوه فیزیک آزمون IMAT

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مهر ماه 1400

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## Table of Contents

Measures.....	3
Kinematics.....	5
Dynamics.....	Error! Bookmark not defined.
Work, Energy & Power.....	Error! Bookmark not defined.
Fluid Mechanics .....	Error! Bookmark not defined.
Thermodynamics and Thermal Physics.....	Error! Bookmark not defined.
Electrostatic and Electrodynamics.....	Error! Bookmark not defined.
Solution to Measures.....	Error! Bookmark not defined.
Solution to Kinematics .....	Error! Bookmark not defined.
Solution to Dynamics .....	Error! Bookmark not defined.
Solution to work, Energy & Power.....	Error! Bookmark not defined.
Solution to Fluid Mechanics.....	Error! Bookmark not defined.
Solution to Thermodynamics.....	Error! Bookmark not defined.
Solution of Electrostatics and Electrodynamics.....	Error! Bookmark not defined.

### مقدمه مولف:

این جزوه در مهرماه ۱۴۰۰ تکمیل شده است و شامل سرفصلهای فیزیک آزمون آیمت است.

تدریس همه سرفصلهای فیزیک مورد نیاز برای این آزمون، نیاز به هزاران صفحه جزوه دارد که البته در کتب درسی و کمک آموزشی موجود است و هدف ما هم تدریس همه مباحث بصورت جامع نبوده است.

قصد ما از این مجموعه سوالات یک سری سوالات تمرینی و البته با هدف تشخیص نقاط ضعف داوطلب است که وقتی داوطلب این سوالات را خودش حل کند و در مبحثی احساس ضعف کند، میتواند به کتب رفرنس و یا معلم خصوصی مراجعه کرده و ایرادش را رفع کند. اگرچه پاسخ تشریحی همه سوالات آورده شده و سعی شده که این مجموعه سوالات تا حد امکان حالت خودآموز داشته باشد. سوالات هم از نمونه سوالات واقعی آزمون IMAT و هم از سوالات متفرقه شبیه به آزمون تشکیل شده است.

از آنجایی که هیچ کاری بی ایراد نیست از خواننده درخواست میشود ایرادات و اشکالات احتمالی این جزوه را از طریق ایمیل [mirabieducenter@gmail.com](mailto:mirabieducenter@gmail.com) با ما در میان بگذارد.

عماد میرایی

مهرماه ۱۴۰۰

## Measures

- 1 Electric current may be expressed in which one of the following units?
- a)  $\frac{\text{coulombs}}{\text{volt}}$                       b)  $\frac{\text{joules}}{\text{coulomb}}$                       c)  $\frac{\text{coulombs}}{\text{second}}$
- d)  $\frac{\text{ohm}}{\text{second}}$                       e)  $\frac{\text{joules}}{\text{volt}}$
- 2 A Newton is equal to which of the following?
- a) kilogram- meter per second  
b) meter per second squared  
c) kilogram- meter per second squared  
d) kilogram per meter- second  
e) kilogram- meter squared per second
- 3 As defined in physics work is
- a) a scalar quantity  
b) a vector quantity  
c) always positive  
d) always zero  
e) a fundamental quantity
- 4 Which of the following is not one of the fundamental quantities in physics?
- a) time                      b) length                      c) mass                      d) temperature                      e) weight
- 5 Which of the following pair are vector quantities?
- a) time and space                      c) energy and time                      e) force and work  
b) force and momentum                      d) momentum and mass
- 6 The SI unit of atmospheric pressure is
- a) Dyne                      b) Newton                      c) cmHg                      d) Pascal                      e) joules

7 Which one of the following units would you use to measure the length of a handbag?

- a) centimeters    b) pounds    c) miles    d) kg    e) newton

8 Which of the following is not among fundamental (base) units?

- a) temperature (K)    c) voltage (v)    e) time (s)  
b) amount of substance (mol)    d) luminous intensity (Cd)

9 In equation  $A = \frac{BC^2}{D}$ , unit of A is newton, D is in second, C is in meters  
What is the unit of B?

- $\frac{N}{m^2 \cdot s}$      $\frac{N \cdot s}{m^2}$      $\frac{N \cdot s}{m}$      $\frac{N}{m \cdot s}$      $\frac{m^2 \cdot s}{N}$

10 1 ml is equal to 1...

- a)  $cm^3$     b)  $cm^2$     c)  $dm^3$     d)  $dm^2$     e) Lit

11 Change the units of  $4 \frac{km}{s}$  to  $\frac{m}{h}$  in scientific notation.

- a) 14400    b)  $1.44 \times 10^4$     c)  $1.44 \times 10^7$     d) 1440000    e)  $1.44 \times 10^6$

12 We've measured mass of a substance with a scale (precision 0.1 gr)  
Which one of the following cannot be the result of this measurement (in grams)?

- 32.0    32.09    32.5    32.9    33.7

13 Which one can be the resultant force of two 18N, 20N forces?

- 0    1.5    3    40    1

14 Resultant force of  $\vec{F}_1$ ,  $\vec{F}_2$  is equal and perpendicular to  $\vec{F}_1$ . what is  $\frac{|\vec{F}_1|}{|\vec{F}_2|} = ?$

$$\frac{1}{2}$$

$$\sqrt{2}$$

$$\frac{\sqrt{2}}{2}$$

$$2$$

$$\frac{\sqrt{3}}{2}$$

15 Which one is incorrect regarding submultiples

- a) *deci, d, 0.1*
- b) *centi, c,  $10^{-2}$*
- c) *nano, n,  $10^{-6}$*
- d) *mili, m, 0.001*
- e) *pico, p,  $10^{-12}$*

16 Which one is incorrect about cgs system of units?

- a) unit of force is dyne,  $1 \text{ dyne} = 10^{-5} \text{ N}$
- b) unit of mass is gram,  $1 \text{ gram} = 10^{-3} \text{ kg}$
- c) unit of length is meter,  $1 \text{ m} = 10^2 \text{ cm}$
- d) unit of density is  $\text{gcm}^{-3}$ ,  $1 \text{ gcm}^{-3} = 10^3 \text{ kgm}^{-3}$
- e) unit of energy is erg,  $1 \text{ erg} = 10^{-7} \text{ joules}$

17 Which one is correct about units of power (watt) in terms of L, T, M?

- a)  $MLT^{-1}$
- b)  $ML^2T^{-2}$
- c)  $MLT^{-2}$
- d)  $ML^2T^{-3}$
- e)  $MLT^{-3}$

18 Which quantity has the unit equal to  $ML^2T^{-2}$

force

energy

power

momentum

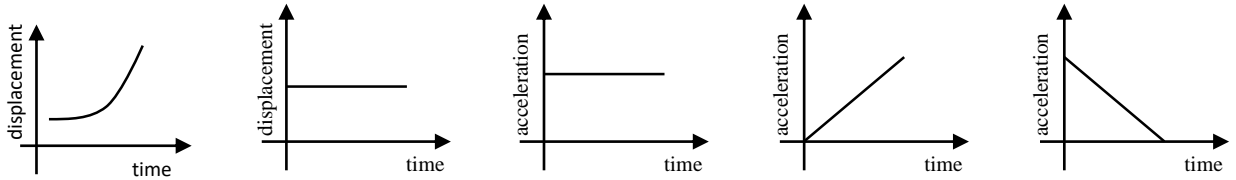
acceleration

## Kinematics

1 Which one is not a kinematics quantity?

- a) displacement
- b) velocity
- c) speed
- d) force
- e) acceleration

2 Which of the following graphs best represents a particle with constant velocity?



3 A particle moving in a straight line slows down at a constant rate from  $50 \frac{m}{s}$  to  $25 \frac{m}{s}$  in 2 seconds. What is the acceleration of the particle?

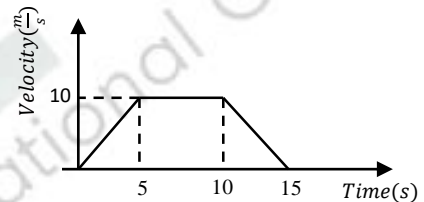
- a)  $-12.5 \frac{m}{s^2}$       b)  $-25 \frac{m}{s^2}$       c)  $-50 \frac{m}{s^2}$       d)  $-100 \frac{m}{s^2}$       e)  $-11.25 \frac{m}{s^2}$

4 A driver moving at a constant speed of  $20 \frac{m}{s}$  sees an accident up ahead and hits the brake. If the car decelerates at a constant rate of  $-5 \frac{m}{s^2}$ , How far does the car go before it comes to a stop?

- 10 m      20 m      40 m      50 m      100 m

5 The graph below represents a particle moving in a straight line. When  $t = 0$  The displacement of the particle is 0.

All of the following statements are true about the particle EXCEPT:



- A) The particle has a total displacement of 100 m.  
 B) The particle moves with constant acceleration from 0 to 5 seconds.  
 C) The particle moves with constant velocity between 5 and 10 seconds.  
 D) The particle is moving backwards between 10 and 15 seconds.  
 E) Average speed and average velocity numbers are the same over the whole interval.

6 A particle is moving on a straight line between cities A, B. if it goes half of way at  $40 \frac{m}{s}$  and the remaining half at the rate of  $60 \frac{m}{s}$ , what is the average velocity?

- a)  $50 \frac{m}{s}$       b)  $48 \frac{m}{s}$       c)  $24 \frac{m}{s}$       d)  $49 \frac{m}{s}$       e)  $52 \frac{m}{s}$

7 A particle is moving on a straight line between cities A, B. if it goes half of the time at  $40 \frac{m}{s}$  and the remaining time at the rate of  $60 \frac{m}{s}$ , what is the average velocity between cities A, B?

- a)  $50 \frac{m}{s}$       b)  $48 \frac{m}{s}$       c)  $24 \frac{m}{s}$       d)  $49 \frac{m}{s}$       e)  $52 \frac{m}{s}$

8 A particle is moving in  $xoy$  plane. At  $t = 1$  s it is in  $\vec{r}_1 = 4i + 11j$ .  
At  $t = 3$  s it is in  $\vec{r}_2 = -i - j$ .  
Which choice show the average velocity? (units are in SI)

- a)  $-2.5 i - 6 j$       c)  $2.5 i + 6 j$       e)  $-1.5 i - 5 j$   
b)  $1.5 i + 5 j$       d)  $-1.5 i + 5 j$

9 A particle is moving along a circular path of radius 10 m.  
If it goes half a circle in 3 seconds, what's its average speed and average velocity?

- a)  $\frac{10\pi}{3}, \frac{20}{3}$       b)  $\frac{20\pi}{3}, \frac{20}{3}$       c)  $\frac{20}{3}, \frac{10\pi}{3}$       d)  $\frac{10}{3}, \frac{20}{3}$       e)  $\frac{10\pi}{3}, \frac{10}{3}$

10 A boat travels on a straight path of 1800m in direction of water flow in 1.5 min.  
It takes the boat 2.5 min for the same path in reverse direction.  
What's the velocity of water related to the stagnant shore? (in  $\frac{m}{s}$ )

- 16      10      4      8      20

11 If an apple is dropped from an altitude of 100 m, it reaches an altitude of 80 m after falling for  $t = 2$  seconds. What altitude will it be in  $t = 4$  seconds?

- 60      40      30      20      0

12 A bullet hits a wooden door at speed of  $20 \frac{m}{s}$  and comes out at speed of  $5 \frac{m}{s}$ . The width of door is 5 cm. Assuming constant acceleration while moving in the wooden door, how long does it take to go through the door? (in seconds)

- $10^{-3}$       0.4       $4 \times 10^{-3}$        $4 \times 10^{-2}$       0.002

13 A particle is moving with constant acceleration along a straight line. Between  $t = 0$  &  $t = 3$  it moves 15 m. between  $t = 3$  &  $t = 6$  it moves 33 m. what is the acceleration in  $\frac{m}{s^2}$ ?

- 1                      2                      3                      4                      4.5

14 Equation of motion of a particle is given by  $v = 2t + 4$  I SI. What is the displacement between  $t = 3$ ,  $t = 4$ ?

- 10                      11                      12                      32                      16

15 Equation of motion of a particle moving in  $xoy$  plane is given by  $\begin{cases} x=8t \\ y=-\frac{t^2}{2}+3t \end{cases}$  in SI. What is the angle between velocity and acceleration vector at  $t = 3$  s?

- 0                       $\frac{\pi}{4}$                        $\frac{\pi}{6}$                        $\frac{\pi}{3}$                        $\frac{\pi}{2}$

16 Two particles move at constant speed of  $1 \frac{m}{s}$  along the lines  $y_1 = x + 4$ ,  $y_2 = -x + 4$ , starting from their intersection. After 3 seconds, what is the distance between them? (in m)

- 6                      4                      3                       $3\sqrt{3}$                        $4\sqrt{2}$