حل نموذج اختبار تجريبي منهج انسباير

موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف التاسع المتقدم ⇦ فيزياء ⇦ الفصل الأول ⇦ حلول ⇦ الملف

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المزيد من مادة فيزياء:	ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس
	إعداد: مدارس التكنولوجيا التطبيقية

التواصل الاجتماعي بحسب الصف التاسع المتقدم

صفحة المناهج الإماراتية على فيسبوك					
المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب الصف التاسع المتقدم والمادة فيزياء في الفصل الأول

ثانوية التكنولوجيا التطبيقية
Applied Technology High School

Term 1 – Practice Questions (Part 1)

Grade 09–Physics

PHY40A/41

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 1: **A Physics Tool Kit** Section 1.1– Methods of Science (KPIs 1.1.1 – 1.1.3)	3	2	Chapter 1

- ## Practice Questions

Multiple Choice

1. ___ describes a rule of nature.

A. Scientific theory
B. Scientific method
√ C. Scientific law
D. Physics

2. Scientists make an educated guess about a question they ask called a _____.

√ A. hypothesis
B. scientific theory
C. scientific method
D. model

3. The experimental process that a scientist uses to solve a question involves a variety of ____

A. hypothesis
B. scientific laws
√ C. scientific methods
D. models

4. A_____ is an explanation supported by experimental results

A. hypothesis
√ B. scientific theory
C. Scientific law
D. model

5. Physicists use ____ to accurately predict how systems will behave.

A. graphs
B. The line of best fit
√ C. models
D. relationships

6. A paper airplane could be considered a scientific ____.

A. law
B. method
√ C. model
D. theory

Answer the following questions

1. Fill in the blanks:

a. A ____Scientific method_____ is a systematic way to observe, experiment and analyze the world.

b. A(n) __hypothesis_____ is an educated guess about how variables are related.

c. A(n) __scientific law__ is description of a rule of nature.

d. A(n) __scientific theory__ is an explanation supported by experimental results.

e. A _model___ is a representation of an idea, event, structure, or object that helps people to better understand it.

2. Number the following steps in the order in which scientists study problems.

___2___ Draw a conclusion.

___1___ Compare experimentation with careful measurements and analyses of results.

___3___ Test deductions to determine if they are valid

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 1: **A Physics Tool Kit** Section 1.2– Mathematics in Physics (KPIs 1.2.1 – 1.2.5)	5	2	Chapter 1 Section 2

- **<u>Practice Questions</u>**

Multiple Choice

1. Which of the following is a base unit?

A. Grams
√ B. Kelvin
C. Minutes
D. Newton

2. Which of the following is a base unit?

√ A. Ampere
B. Volt
C. Newton
D. Joule

3. Which of the following is not an SI unit of measurement?

A. Meter
B. Second
C. Kilogram
√ D. Kilometer

4. The SI base unit used to measure mass is the ___.

A. gram
B. meter
√ C. kilogram
D. milligram

5. Which of the following is the derived quantity with its correct SI unit?

	Quantity	Unit
A.	Mass	Kilogram
B.	Temperature	Kelvin
C.	Current	Ampere
√ D.	Force	Newton

6. Force is a product of mass and acceleration. Which combination of fundamental units can be used to express the force acting on an object?

A. kg
B. m/s^2
C. kgm/s
√ D. kgm/s^2

7. Which of the following is the base unit for pressure?

A. m/s
B. m/s^2
C. $kg \cdot m/s^2$
√ D. kg/ms^2

8. The derived unit used to measure power is ___.

A. $kg.m/s$
√ B. $kg.m^2/s^3$
C. $kg.m/s^3$
D. $kg/m.s^2$

9. If quantity ***X*** is measured in ***kg***, quantity ***Y*** is measured in ***m/s***, and quantity ***Z*** is measured in ***m***, what is the unit for the calculated quantity: $\frac{XY^2}{Z}$

√ A. $kg.m/s^2$
B. $kg.m^2/s^2$
C. $kg.m/s$
D. $kg.m^2/s$

Answer the following questions

1. List six base quantities and their respective units in the table below.

Base Quantities	Base Units
Length	Meter (m)
Mass	Kilogram (kg)
Time	Second (s)
Temperature	Kelvin (K)
Electric Current	Ampere (A)
Luminous Intensity	Candela (Ca)

2. Classify each of the following as a base or derived unit.

Unit	Base/ derived
m	Base
m/s	Derived
kg	Base
$Kg.m/s2$	Derived
m^2	Derived
s	Base

3. Classify the quantities as base or derived by putting a tick (√) and write their corresponding SI units.

Quantity	Base	Derived	SI units
Current	√		Ampere
Temperature	√		Kelvin
Acceleration		√	Meter/(second)^2
Energy		√	Joules
Pressure		√	Pascal
Luminous Intensity	√		Candela
Power		√	Watt
Time	√		Second
Length	√		Meter

4. The table below shows the physical quantities and their respective formulas. Write their units in terms of their fundamental base units.

Quantity	Formula	Fundamental Base units
Kinetic Energy	$KE = \frac{1}{2} \times mass \times velocity^2$	$kg\left(\frac{m}{s}\right)^2$
Force	$F = mass \times acceleration$	$kg\left(\frac{m}{s^2}\right)$
Power	$p = Force \times velocity$	$kg\left(\frac{m^2}{s^3}\right)$
Pressure	$P = \frac{Force}{Area}$	$\frac{kg}{ms^2}$

5. Using units, validate if the equations below are dimensionally correct. Note that x is distance v is speed, t is time and a is acceleration.

a. $x = \frac{1}{2}at^2$

$Unit\ of\ distance, \quad x = m$

$Unit\ of\ acceleration, a = m/s^2$

$Unit\ of\ time, t = s$

$\therefore Unit\ for\ \frac{1}{2}at^2 = \left(\frac{m}{s^2}\right) \times s^2 = m \implies same\ as\ unit\ for\ x$

b. $v = at$

$Unit\ of\ velocity, \quad v = m/s$

$Unit\ of\ acceleration, a = m/s^2$

$Unit\ of\ time, t = s$

$\therefore Unit\ for\ at = \left(\frac{m}{s^2}\right) \times s = m/s \implies same\ as\ unit\ for\ v$

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 1: **A Physics Tool Kit** Section 1.3– Measurements (KPIs 1.3.1 – 1.3.2)	2	1	Chapter 1 Section 3

- ## Practice Questions

Multiple Choice

1. _____ is the apparent shift of an object when it is viewed from different angles.

A. Accuracy
B. Double vision
C. Measurement
√ D. Parallax

2. ___ describes how well the results of a measurement agree with the real value.

A. Precision
√ B. Accuracy
C. Error
D. Measurement

3. The degree of exactness of a measurement is called ____.

√ A. Precision
B. Accuracy
C. Error
D. Measurement

4. A device with very small divisions on its scale can measure with _____.

A. agreement
√ B. precision
C. scientific notation
D. fundamental units

5. Four students reported results from an experiment.

Mass of Unknown Liquid			
Student A	Student B	Student C	Student D
52.3 g	52.35 g	52.353 g	53 g

Which student is more precise?

A. Student A
B. Student B
√ C. Student C
D. Student D

6. The length of the student desk is measured using a measuring tape as 1.20 m. how many significant figures is this measurement?

A. 1
B. 2
√ C. 3
D. 4

7. The degree of possible error in a measurement is called its _____.

A. fundamental unit
B. mechanical quantity
C. precision balance
√ D. margin of uncertainty

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 1: **A Physics Tool Kit** Section 1.4– Graphing Data (KPIs 1.4.1 – 1.4.4)	4	1	Chapter 1 Section 4

- ## Practice Questions

Multiple choice questions

1. Which describes an independent variable?

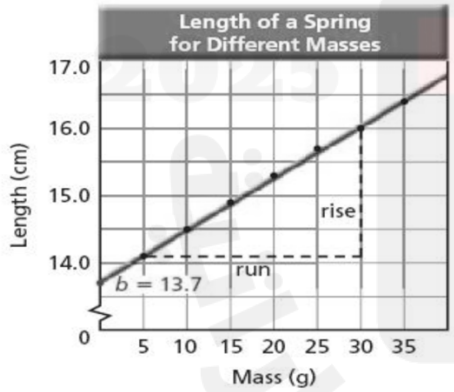
√ A. The factor that is changed or manipulated during an experiment

B. The factor that depends on what is changed or manipulated during an experiment

C. The line of best fit

D. The result of an experiment

2. Where is the dependent variable plotted on the graph?



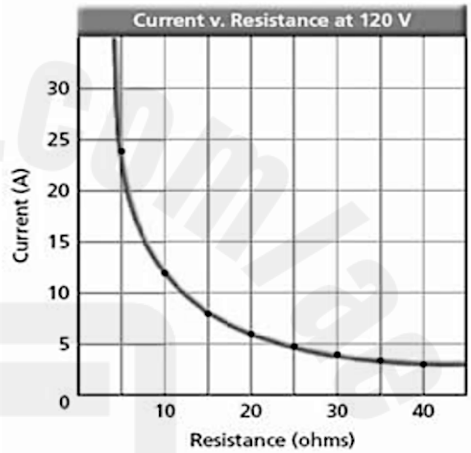
A. Horizontal axis

√ B. Vertical axis

C. At the origin

D. The dotted line

Questions 3 and 4



3. What type of relationship is represented in this graph?

A. Linear

√ B. Inverse

C. Reverse

D. Quadratic

4. What can you determine from looking at this graph?

A. As resistance decreases, current decreases

√ B. As resistance increases, current decreases

C. As resistance increases, current stays the same

D. As current increases, resistance increases

Answer the following questions.

1. Fill in the blanks.

   a. A(n) ___inverse relationship____ describes the relationship between two variables in which an increase in one variable results in the decreases of another variable.

   b. On a graph, the ____ line of best fit_____ is the line drawn as close as possible to all of the data points.

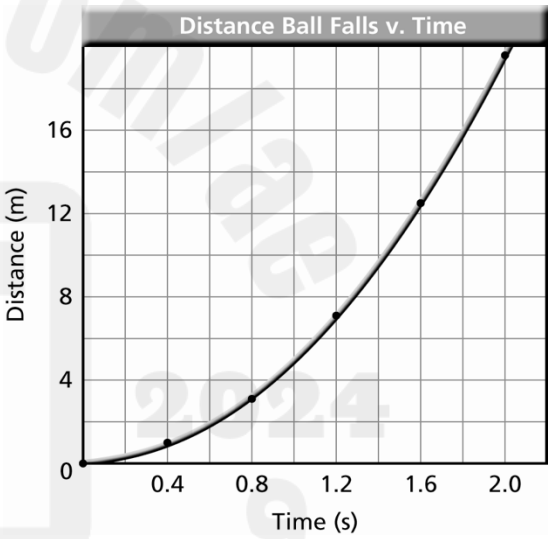
   c. The ___independent variable____ is the factor that is changed or manipulated during an experiment.

   d. The __dependent variable__ is the factor that depends on the independent variable

   e. A straight line on a graph shows that there is a(n) __linear relationship__ between the two variables

   f. A(n) __quadratic relationship____ exists when one variable depends on the square of another.

2. The figure below is a distance versus time graph for a falling ball.



   a. What sort of relationship is shown in this graph?
   Quadratic relationship

   b. Which variable is the independent variable? Which is the dependent variable?

   Independent variable: Time
   Dependent variable: Distance

   c. Is the slope of this graph positive or negative?
   Positive

   d. What are the units of the slope?
   m/s

   e. Explain why the slope at 2.0 s is greater than the slope at 1.0 s.
   The graph is steeper at 2.0 s than at 1.0 s.

   f. About how far does the ball fall in 1.8 s?
   16 m

   g. The equation of the graph is $d = 5t^2$. How far would the ball fall in 2.4 s?
   29 m

3. For each description on the left, write the letter of the matching term on the right.

__b__	the equation of a linear relationship	**a.** straight line
__a__	the shape of a graph of a linear relationship	**b.** $y = mx + b$
__d__	the equation of an inverse relationship	**c.** $y = ax^2 + bx^2 + c$
__c__	the equation of a quadratic relationship	**d.** $y = \frac{a}{x}$

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 2: Representing Motion Section 2.1: Picturing Motion (KPIs 2.1.1 – 2.1.2)	2	1	Chapter 2

- ## Practice Questions

Multiple choice question

1. A motion diagram is a series of images of a moving object that records its position after ____

A. 1/30 s
B. it comes to rest
√ C. equal time intervals
D. an acceleration

2. What is the purpose of drawing a motion diagram or a particle model?

A. To calculate the speed of the object in motion
B. To calculate the distance covered by the object in a particular time
√ C. To check whether an object is in motion
D. To calculate the instantaneous velocity of the object in motion

3. Replacing an object in a motion diagram with a single point is called the ____.

A. alternative model
B. frame differential
C. operational definition
√ D. particle model

4. Which statement describes best the motion diagram of an object in motion?

A. A graph of the time data on a horizontal axis and the position on a vertical axis
√ B. A series of images showing the positions of a moving object at equal time intervals
C. Diagram in which the object in motion is replaced by a series of single point
D. A diagram that tells us the location of zero point of the object in motion and the direction in which the object is moving

Answer the following questions

1. Fill in the blanks

a. A simplified motion diagram that shows the object in motion as a series of points is a __particle model__

b. A __motion diagram__ shows a series of images showing the position of a moving object over equal time intervals

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 2: Representing Motion Section 2.2: Where and When- Describing Motion (KPIs 2.2.1 – 2.2.4)	4	2	Chapter 2

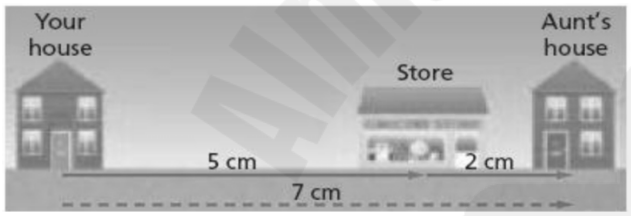
- **Practice Questions**

Multiple choice question

1. In a coordinate system the ____ is the point at which both variables have the value zero.

A. distance
B. magnitude
√ C. origin
D. vector

2. In this image, 7 cm represents the ____.



A. origin
√ B. resultant
C. scalar
D. interval

3. Final position minus the initial position is called ____.

A. distance
√ B. displacement
C. magnitude
D. time interval

4. Which of the following quantities is a vector?

A. Distance
B. Speed
C. Work
√ D. Displacement

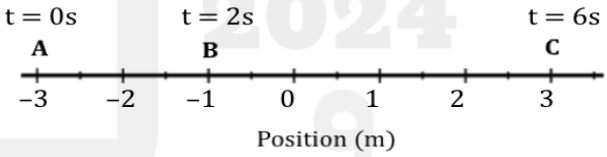
5. All of the following are scalar quantities except ____.

A. mass
B. distance
√ C. acceleration
D. temperature

6. Which of the following physical quantities is not a vector quantity?

√ A. Time
B. Force
C. Velocity
D. Acceleration

7. The diagram below shows the position of an object changing with time.

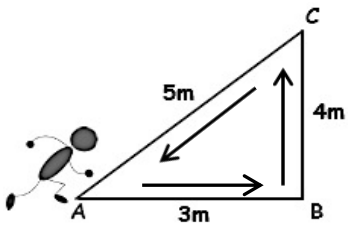


The displacement of the object if it moves from A to C and then back to B is ___.

A. 1 m
√ B. 2 m
C. 4 m
D. 6 m

8. A boy moved from point A to B to C and finally back to A as shown below. What is his displacement?

√ A. 0 m
B. 3 m
C. 5 m
D. 12 m

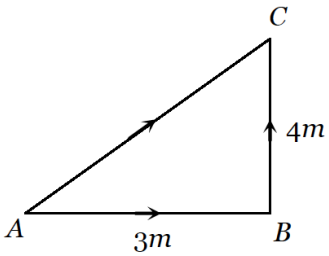


Questions 9 and 10

A particle starts from A and reaches C through point B as shown in the figure.

9. The distance travelled by the particle is ___.

A. 1 m
B. 3 m
C. 5 m
√ D. 7 m



10. The displacement of the particle is ___.

A. 1 m
B. 3 m
√ C. 5 m
D. 7 m

Answer the following questions

1. Fill in the blanks:

a. A __vector__ is a quantity with both magnitude and direction.

b. A vector that represents the sum of two or more vectors is a __resultant__

d. Another term given for the size of a quantity is the __magnitude__ .

e. The formula $t_f - t_i$ represents __time interval__ .

f. A quantity that has only magnitude is _scalar__ .

g. A system that defines the zero point of the variable you are studying is the _coordinate system__ .

h. The zero point is also called the __origin__ .

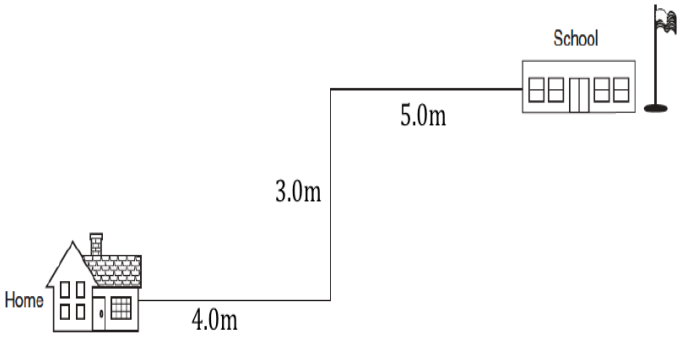
i. The vector quantity that defines the distance and direction between two positions is __displacement__ .

j. A scalar quantity that is the length, or size, of the displacement vector is __distance__ .

2. Classify the following quantities into scalar or vector quantities by putting a tick (√) in the table below.

Quantity	Scalar	Vector
Distance	√	
Displacement		√
Speed	√	
Velocity		√
Acceleration		√
Force		√
Work	√	
Energy	√	
Pressure	√	

3. A student on her way to school walks 4.0m east, 3.0m north and another 5.0m east, as shown in the diagram.



a. Calculate the total distance she covers from her home to school.

$Total\ distance = 4.0m + 3.0m + 5.0m$
$= 12.0m$

b. Compared to the distance she walks, the magnitude of her displacement from home to school is _____ (Tick the correct answer).

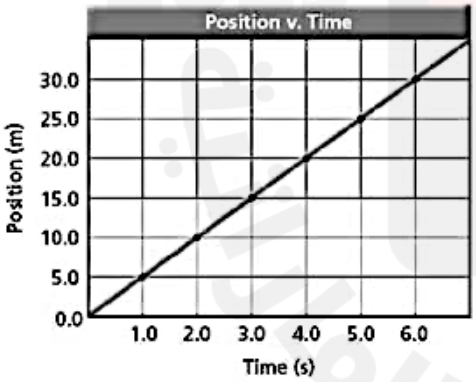
- ☐ Less
- ☐ Greater
- ☐ The same

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 2: Representing Motion Section 2.3: Position-Time Graph (KPIs 2.3.1 – 2.3.2)	2	2	Chapter 2

- **Practice Questions**

Multiple choice question

1. When did the runner described in the graph reach 15.0 m beyond the starting point?



A. 1.0 s
B. 2.0 s
√ C. 3.0 s
D. 4.0 s

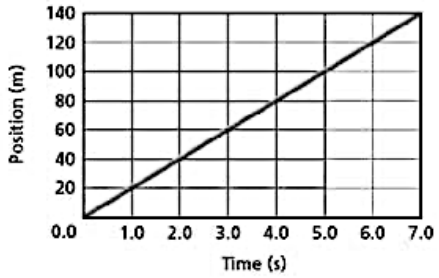
2. _____ is an object's position at a particular instant.

A. Final position
√ B. Instantaneous position
C. New position
D. Real position

3. Will the blue jogger catch up to the red jogger?

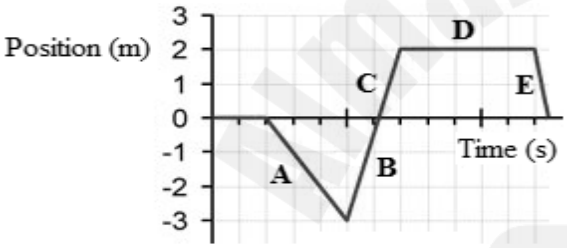
√ A. No, the lines get farther apart with time
B. No, the blue jogger is has more mass
C. Yes, the blue jogger is running faster
D. Yes, since they started at the same time

4. The graph represents a hockey puck gliding across a frozen pond. How far did the puck move between 0 s and 4 s?



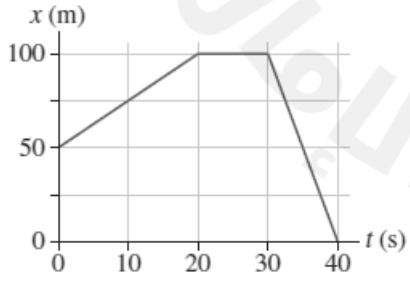
A. 20 m
B. 40 m
C. 60 m
√ D. 80 m

5. The position-time graph below represents a motion of an object. Which parts of the motion did the object have negative velocity?



A. A and B
√ B. A and E
C. C and B
D. C and E

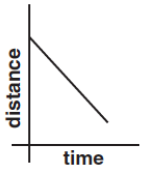
6. A motion of a car is represented by the position-time graph shown below. At what time was the car at position $x = 50\ m$?



A. At $t = 0s$ *and* $t = 40s$
√ B. At $t = 0s$ and $t = 35s$
C. At $t = 30s$ *and* $t = 40s$
D. At $t = 20s$ *and* $t = 30s$

7. An object moves away from a motion detector with a constant speed. Which graph best represents the motion of the object?

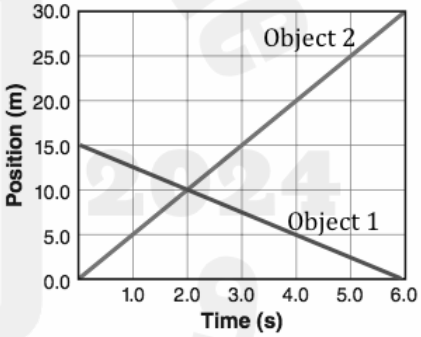
A. 

B. 

√ C. 

D. 

Questions 8 and 9
The position-time graph for two objects is as shown below.



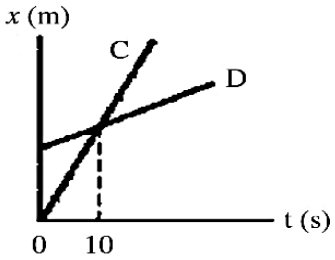
8. At what **position** and **time** did *object* 1 cross *object* 2?

		Position	**Time**
√	A.	10.0 m	2.0 s
	B.	10.0 m	6.0 s
	C.	15.0 m	2.0 s
	D.	15.0 m	6.0 s

9. What is the distance between the two objects at 4.0 s?

A. 5.0 m
B. 10.0 m
√ C. 15.0 m
D. 20.0 m

10. The figure below shows a graph of the position *x* of two cars, C and D, as a function of time *t*.



Which of the statements about these cars must be true?

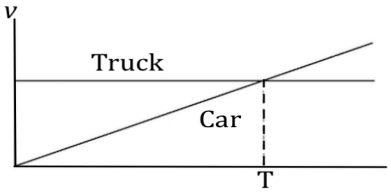
√ A. The cars meet at time t = 10 s

B. The acceleration of car C is less than the acceleration of car D

C. At time t = 10 s, both cars have the same velocity

D. The acceleration of car C is greater than the acceleration of car D

11. The motion of a car and a truck along a straight road are represented by the velocity-time graphs in the figure below. The two vehicles are initially alongside each other at time t = 0.



At time *T*, what is true of the *distances* traveled by the vehicles since time *t* = 0?

A. They will have traveled the same distance

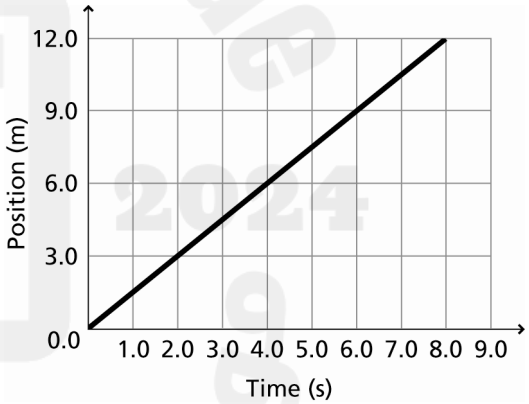
B. The truck will not have moved

C. The car will have travelled further than the truck

√ D. The truck will have travelled further than the car

Answer the following questions

1. Refer to the diagram below to answer questions (a to f) below.



a. What is the position of the object at 6.0 s?
9.0 m

b. How much time has passed when the object is at 6.0 m?
4.0 s

c. How far does the object travel for every second it is in motion?
1.5 m/s

d. If the object continues at this speed, when will the object reach 18.0 m?

$$v_{av} = \frac{\Delta x}{\Delta t}$$

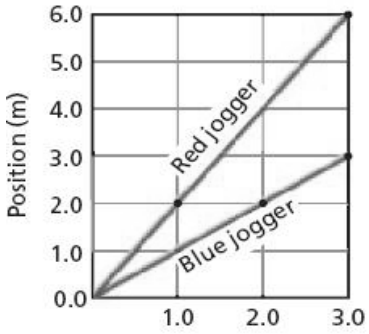
$$\Delta t = \frac{\Delta x}{v_{av}} = \frac{18.0\ m}{1.5\ m/s} = 12\ s$$

e. Where will the object be after 300 s?

$$v_{av} = \frac{\Delta x}{\Delta t}$$

$$\Delta x = v_{av} \times \Delta t = (1.5\ m/s)(300\ s) = 400\ m$$

7. The position-time graph below represents the motion of two joggers.



a. Which jogger has a higher speed. Explain why?

The red jogger has a higher speed as the line is steeper, or it covers more distance in the same time.

b. Will the blue jogger catch up to the red jogger during the motion shown in the graph? How can you tell?
No, the lines representing the blue jogger and the red jogger get farther apart as time increases.

c. How far apart were the two runners at $t = 2.0\ s$?
$\Delta x = x_{red} - x_{blue}$
$\Delta x = 4.0m - 2.0m = 2.0m$

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 2: Representing Motion Section 2.4: How Fast- Speed and Velocity (KPIs 2.4.1 – 2.4.6)	6	3	Chapter 2

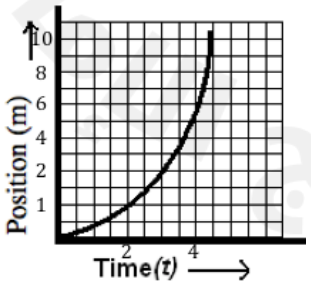
- **Practice Questions**

Multiple choice question

1. ____ is the change in position divided by the time during which the change occurred.

√ A. Average velocity
B. Average speed
C. Instantaneous velocity
D. Instantaneous speed

2. The figure below shows a position-time graph for an object in motion. Its velocity at 4s is called its _____ velocity.



A. average
B. variable
C. constant
√ D. instantaneous

3. You drive a car for 3.0 h at 97 km/h, then for another 3 h at 72 km/h. What is your average velocity?

A. 85 m/s^2
B. 85 km/s^2
√ C. 85 km/h
D. 85 km/h^2

4. What is the average velocity of an object that moves from 6.5 cm to 3.5 cm relative to the origin in 3.0 s?

√ A. 1.0 m/s
B. 2.0 m/s
C. 3.3 m/s
D. 9.0 m/s

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

√ A. when the velocity is constant

B. only when the velocity is decreasing at a constant rate

C. only when the velocity is increasing at a constant rate

D. always

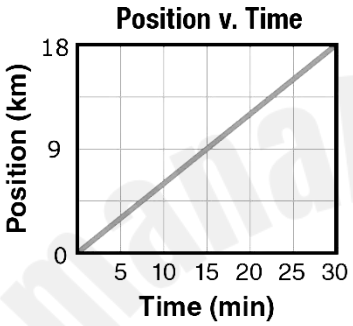
6. The graph below represents the motion of a bicycle. What is the average speed of the bicycle?

A. 0.1 m/s

B. 0.6 m/s

C. 1.7 m/s

√ D. 10 m/s



7. An object's equation of motion is given by

$$x_f = (12\ m) + (5m/s)\ t,$$

where x_f is the final position and t is the time. Which statement is true for the object?

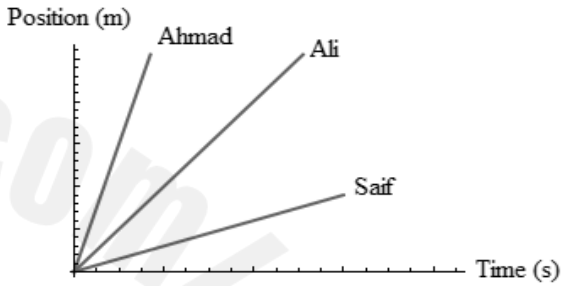
A. Initial velocity could be 12 m/s

√ B. Moves with a constant velocity of 5 m/s

C. Moves with a constant velocity of 12 m/s

D. Accelerates at 5 m/s²

8. Which of the following correctly compares the velocities represented by the graph below?



A. $v_{Saif} > v_{Ali} > v_{Ahmed}$

B. $v_{Saif} = v_{Ali} = v_{Ahmed}$

√ C. $v_{Ahmed} > v_{Ali} > v_{Saif}$

D. $v_{Ali} > v_{Ahmed} > v_{Saif}$

Answer the following questions

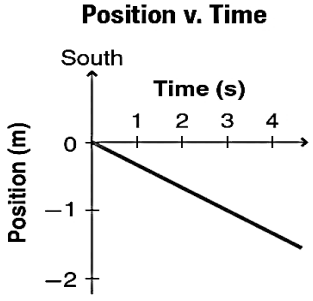
1. Fill in the blanks.

a. The speed and direction of an object at a particular instant is the __instantaneous velocity__ .

b. Ratio of the change in position to the time interval during which the change occurred is the __average velocity__ .

c. The absolute value of the slope on a position-time graph is __average speed__ .

2. The graph below describes the motion of a ship drifting slowly through calm waters. The positive x-direction (along the vertical axis) is defined to be south.



a. What is its average velocity?

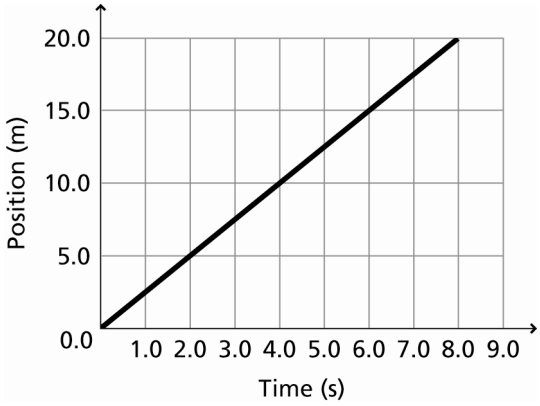
$v_{av} = slope\ of\ the\ graph$

$$v_{av} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{-1 - 0}{3 - 0} = -0.33\ m/s\ or\ 0.33\ m/s\ to\ the\ North$$

b. What is the ship's average speed?

$Average\ speed = |v_{av}| = 0.33\ m/s$

3. Refer to the diagram below to answer the questions below.



a. Find Δt for the change in position from $x = 5\ m$ to $x = 15\ m$.
$\Delta t = t_f - t_i = 6.0\ s - 2.0\ s = 4.0\ s$

b. Find Δx for the time interval from $t = 2.0\ s$ to $t = 8.0\ s$.
$\Delta x = 20.0\ m - 5.0\ m = 15.0\ m$

c. What is the slope of this line?
$Slope = v_{av} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$
$v_{av} = \frac{20.0\ m - 5.0\ m}{8.0\ s - 2.0\ s} = \frac{15\ m}{6.0\ s} = 2.5\ m/s$

d. What does the absolute value of the slope of this line represent?
$Average\ speed = |v_{av}|$

e. What is the speed of this object in m/s?
$Average\ speed = |v_{av}| = 2.5\ m/s$

f. If this object continues at the same speed, how long would it take this object to reach a position of $x = 150\ m$?
$v_{av} = \frac{\Delta x}{\Delta t}$
$\Delta t = \frac{\Delta x}{v_{av}} = \frac{150\ m}{2.5\ m/s} = 60\ s$

g. If this object continues at the same speed, how far will it have traveled when $t = 200\ s$?
$v_{av} = \frac{\Delta x}{\Delta t}$
$\Delta x = v_{av} \times \Delta t = 2.5\ m/s \times 200\ s = 500\ m$

h. What formula would you use to determine the position of this object if it had an initial position vector and then traveled at a fixed velocity for a certain amount of time
$x = v_{av}t + x_i$

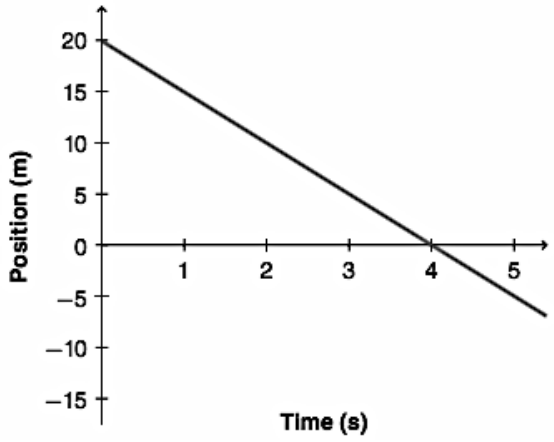
i. How far will this object have traveled if it had an initial position of $220\ m$ and traveled at a speed of $2.5\ m/s$ for $48\ s$?
$x = v_{av}t + x_i = (2.5\ m/s)(48\ s) + 220 = 340\ m$

4. The equation of motion for a person riding a bicycle is $x = 6.0\ m + (5.0\ m/s)t$.

a. Where is the bike at $2.0\ s$?
$x = 6.0\ m + (5.0\ m/s)(2.0\ s) = 16\ m$

b. At what time is the bike at the location $x = 26\ m$?
$26\ m = 6.0\ m + (5.0\ m/s)t$
$t = \frac{26\ m - 6.0\ m}{5.0\ m/s} = 4.0\ s$

5. The graph below shows how the position of an object is changing with time.



a. From the graph identify if the object is moving towards or away from the origin in the first 4s.

The object is moving towards the origin

b. What is the object's average velocity at 4 s?

$v_{av} = slope\ of\ the\ graph$

$$v_{av} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{0 - 20}{4 - 0} = -5m/s$$

c. What is the object's average speed in the last 1s?

$Average\ speed = |-5m/s| = 5m/s$

d. What is the y-intercept?

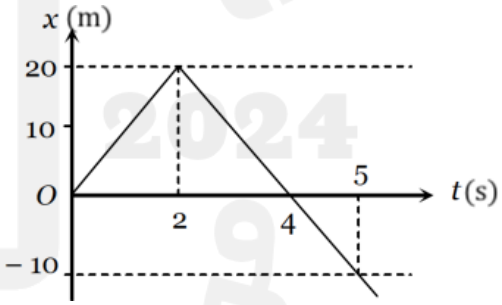
$20\ m$

e. Use your answers from *part b* and *part d* to find the position of the object after 10s.

$x_f = vt + x_i$

$x_f = (-5m/s)(10s) + 20m = -50m + 20m = -30m$

6. The diagram below shows the position-time graph for a particle moving in a straight line.



a. In which of the time intervals below is the velocity of the particle negative? Tick the appropriate box(es).

- ☐ 0 s – 2 s
- ☐ 2 s – 4 s
- ☐ 4 s– 5 s

b. Find the instantaneous velocity at 4 s.

$$v = \frac{-10\ m - 20m}{(5-2)s} = \frac{-30\ m}{3\ s} = -10\ m/s$$

c. What is the total displacement of the particle?

$Total\ displacement\ (d) = d_{0-2s} + d_{2-4s} + d_{4-5s}$

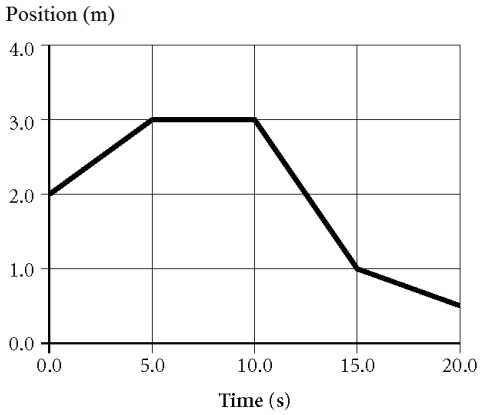
$d = +20\ m + (-20\ m) + (-10\ m) = -10\ m$

d. Find the average velocity of the particle for the interval $t = 0$, $t = 5$.

$$v_{av} = \frac{Total\ displacement}{Total\ time}$$

$$v_{av} = \frac{-10\ m}{5\ s} = -2m/s$$

7. The graph below shows the motion of an object.



a. What is the object's displacement in the first 5 seconds?
$\Delta x = x_f - x_i = 3.0m - 2.0m = 1.0m$

b. Find the average velocity of the object during t =10.0s and $t = 15.0s$?
$v = \frac{\Delta x}{\Delta t} = \frac{1.0m - 3.0m}{15.0s - 10.0s} = -0.40m/s$

c. What is the average speed of the object between t =10.0s and $t = 15.0s$?
$average\ speed = |v| = |-0.40m/s| = 0.40m/s$

d. Write the equation of motion for the final position of the object during the first 5 seconds.
$x_f = vt + x_i$
$x_f = 0.2t + 2$

e. For each description, complete the table with the correct time interval.

Description of motion	Time interval
The object was at rest	$5.0s - 10.0s$
The object was moving toward the negative direction at its lowest speed	$15.0s - 20.0s$
The object was moving at a constant speed toward the positive direction	$0.0 - 5.0s$

Learning Outcome	# of KPI's	Number of Periods	Chapter
Topic 3: Accelerated Motion Section 3.1– Acceleration Section 3.3– Motion with Constant Acceleration (part of) KPIs 3.1.1 – 3.2.3 – (3.2.4 is included in part 2)	 7 3	 2 3	Chapter 3

• Practice Questions

Multiple choice questions

1. As a car is driven south in a straight line with constant speed, the acceleration of the car must be _____.

√ A. zero
B. directed northward
C. directed southward
D. constant, but not zero

2. A car, initially traveling at 15 m/s north, accelerates to 25 m/s north in 4.0 seconds. The magnitude of the average acceleration is ___.

√ A. $2.5\ m/s^2$
B. $6.3\ m/s^2$
C. $10\ m/s^2$
D. $20\ m/s^2$

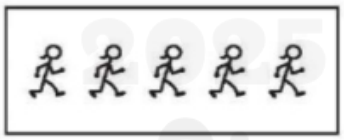
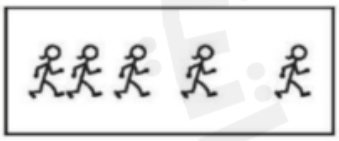
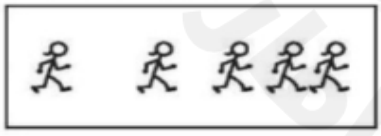
3. A car, initially traveling at 15 m/s north, accelerates at a rate of 2.5 m/s^2. What is its final velocity after 4.0 s?

A. 5.0 m/s
B. 6.0 m/s
√ C. 25 m/s
D. 38 m/s

4. As a car is driven south in a straight line with decreasing speed, the acceleration of the car must be:

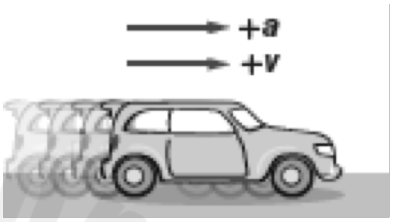
A. zero
√ B. directed northward
C. directed southward
D. constant, but not zero

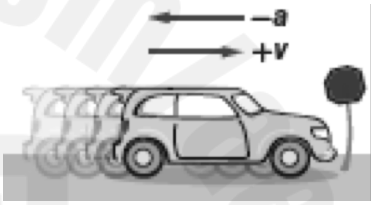
5. Which of the motion diagrams below show an object moving with constant velocity?

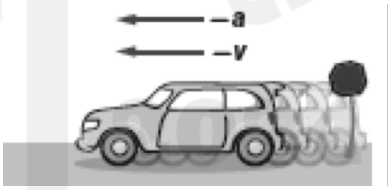
A. 
√ B. 
C. 
D. 

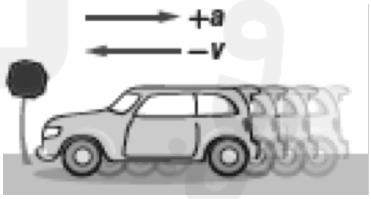
6. The motion of a car is represented by the following particle model.

Which of the following motion diagrams correctly shows the motion of the car?

A. 

√ B. 

C. 

D. 

7. Identify which of the following can all be true about the motion of an accelerating object.

	Velocity	Acceleration	Motion
√ A.	Positive	Positive	Speeding up
B.	Positive	Negative	Speeding up
C.	Negative	Negative	Slowing down
D.	Negative	Positive	Speeding up

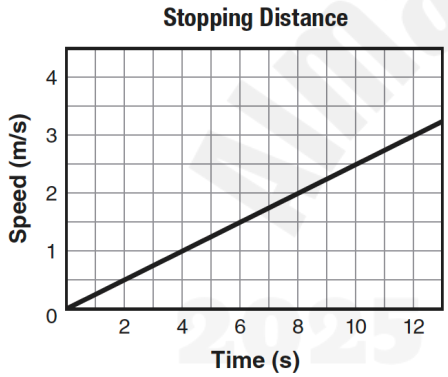
8. The uniform acceleration has a_____.

A. varying magnitude and direction
√ B. constant magnitude and direction
C. varying magnitude and a constant direction
D. constant magnitude and a varying direction

9. If an object's velocity and acceleration have the same direction, then the object is _____.

A. at rest
√ B. speeding up
C. slowing down
D. moving at a constant velocity

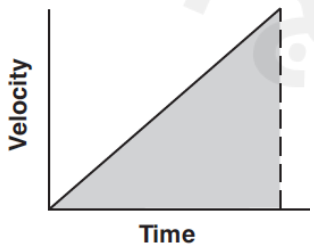
10. The graph below represents the motion of an object. What is the acceleration of the object?



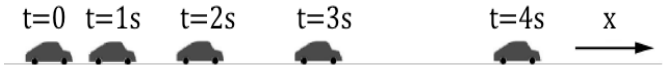
√ A. $0.25\ m/s^2$
B. $0.40\ m/s^2$
C. $2.5\ m/s^2$
D. $4.0\ m/s^2$

11. The graph below represents the relationship between velocity and time of travel for a toy car moving in a straight line. The shaded area under the line represents the car's _____.

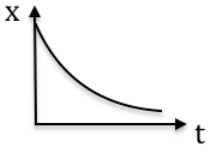
A. speed
B. position
C. acceleration
√ D. displacement

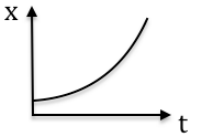


12. The picture below shows the position of a car at different times.



Which of the graphs below correctly represents the car's position as a function of time?

A.


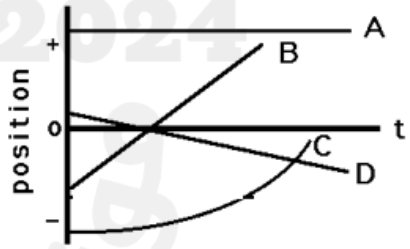
√ B.


C.


D.

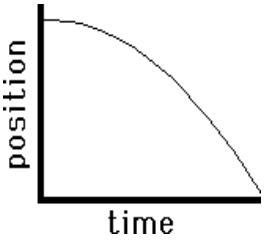

13. The motion of several objects is represented by a position-time graph below. Which object has an acceleration?

A. A
B. B
√ C. C
D. D



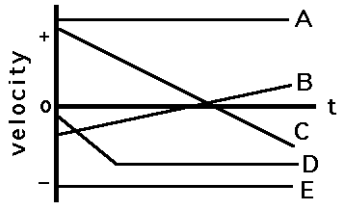
14. The position-time graph for an object is represented by the graph below. Which of the following is/are true regarding the motion of the object?

I. Negative velocity
II. Slowing down
III. Accelerating



A. I only
B. II only
√ C. I and III only
D. II and III only

Questions 15 and 16
The velocity-time graph below represents the motion of five different objects A, B, C, D *and* E.



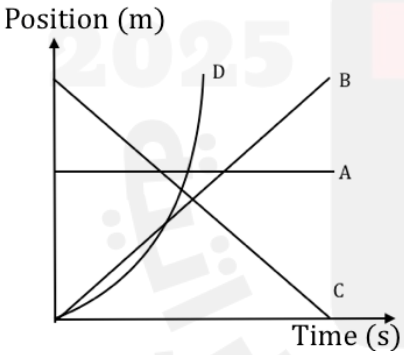
15. Which of the objects is/are moving with a constant velocity?

A. A only
√ B. A and E only
C. B and C only
D. A, B and C only

16. Which object has a constant negative acceleration throughout its motion?

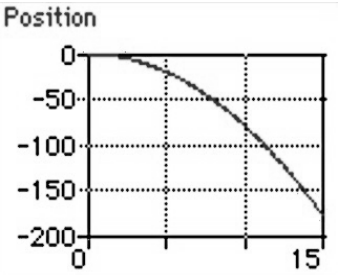
A. B
√ B. C
C. D
D. E

17. The graph below shows the motion of cars A, B, C *and* D. Which of the statements below is true?



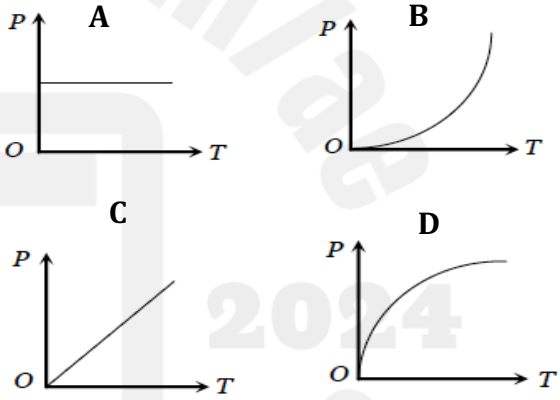
√ A. Car D is accelerating
B. Car C is slowing down
C. Car B has a positive acceleration
D. Car A has a uniform non-zero velocity

18. Which of the statements below is **NOT** correct for an object represented by the position-time graph below?



A. The object has a negative velocity
√ B. The object has a positive acceleration
C. The magnitude of the velocity is increasing
D. Acceleration and velocity are in the same direction

Questions 19 and 20
Below are the position-time graphs for different motions.



19. Which of the graphs represent an object moving with positive acceleration?

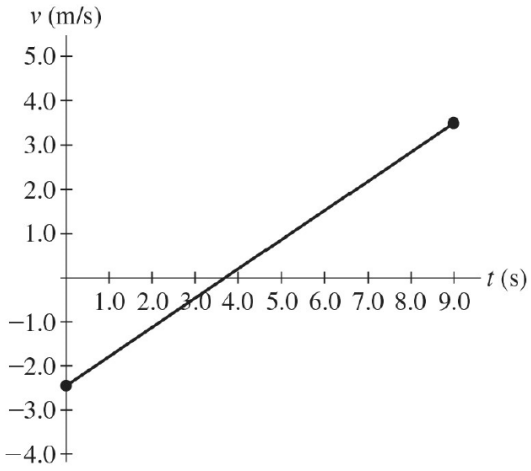
A. A
√ B. B
C. C
D. D

20. Which of the graphs represent an object moving with positive velocity and negative acceleration?

A. A
B. B
C. C
√ D. D

Questions 21 and 22

The motion of a particle is described in the velocity vs. time graph shown in the figure below.



21. Over the nine-second interval shown, we can say that the *acceleration* of the particle ___.

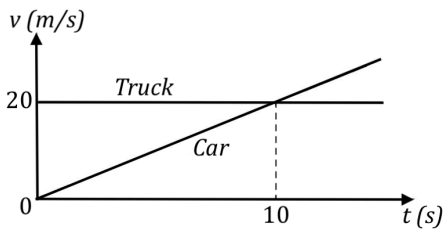
A. only increases
B. increases and then decreases
C. decreases and then increases
√ D. remains constant

22. Over the nine-second interval shown, we can say that the *speed* of the particle ___.

A. only increases
B. increases and then decreases
√ C. decreases and then increases
D. remains constant

Questions 23 and 24

The motions of a car and a truck along a straight road are represented by the velocity-time graphs in the figure below. The two vehicles are initially alongside each other at time $t = 0$.



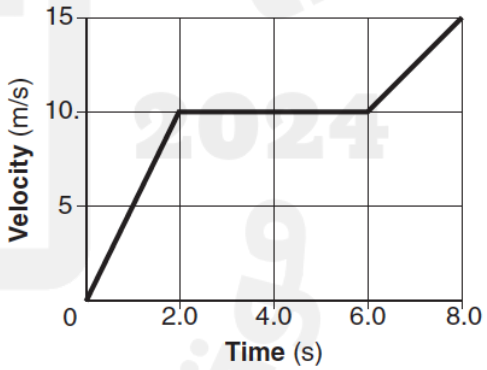
23. At 10 s, what is true of the *distances* traveled by the vehicles since time $t = 0$?

A. They will have traveled the same distance
B. The truck will not have moved
C. The car will have travelled further than the truck
√ D. The truck will have travelled further than the car

24. What are the distances travelled by the truck and the car in 10 s?

	Truck	Car
A.	50 m	100 m
B.	100 m	50 m
C.	100 m	200 m
√ D.	200 m	100 m

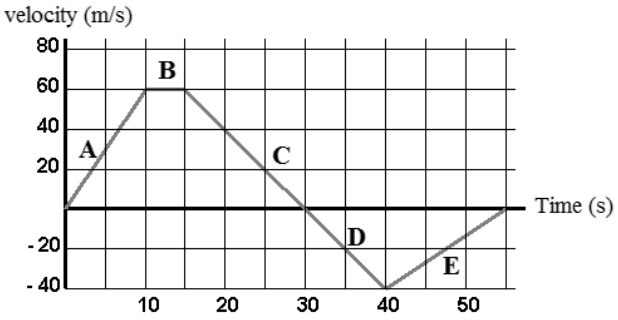
25. The graph below represents the velocity of an object traveling in a straight line as a function of time.



The average acceleration during the first 2.0 s is ___.

A. $0.0\ m/s^2$
B. $0.2\ m/s^2$
C. $2.5\ m/s^2$
√ D. $5.0\ m/s^2$

Questions 26 & 27.
The following velocity-time graph represents the motion of an object.



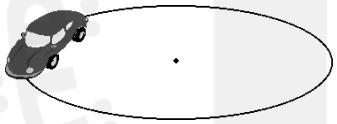
26. When is the acceleration zero?

A. A
√ B. B
C. C
D. D

27. When is the acceleration negative?

A. A
B. B
√ C. C
D. E

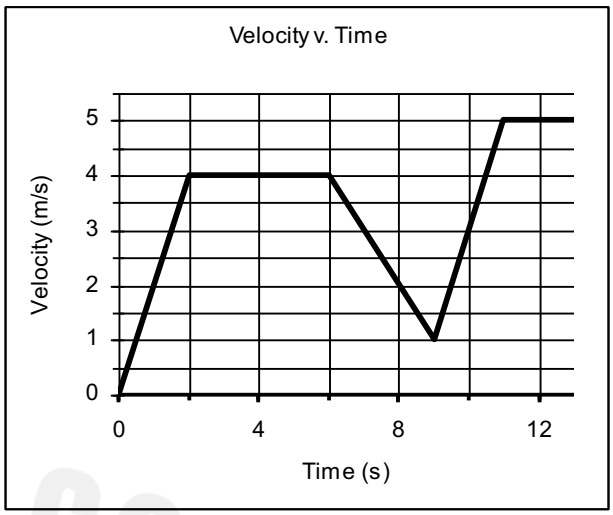
28. A car is taking a circular path with a constant speed of 20m/s.



I. The object has a uniform velocity
II. The direction of motion is changing
III. The object has a non-zero acceleration

A. I only
√ B. II and III only
C. I and III only
D. I, II and III

Questions 29 & 30
The following is a velocity-time graph for the motion of an object.



29. The slope of the graph represents _____.

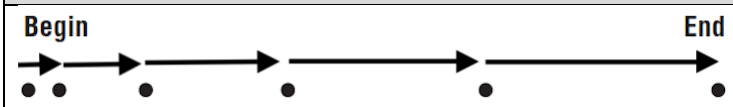
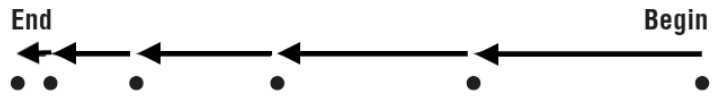
A. speed
√ B. acceleration
C. displacement
D. instantaneous velocity

30. What is the distance covered by the object during the interval $t = 2s$ *to* $6s$?

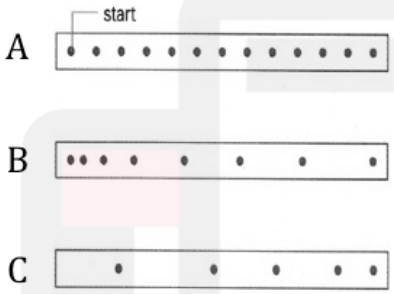
A. 0 m
B. 4.0 m
C. 8.0 m
√ D. 16 m

Answer the following questions.

1. For each of the particle model in the table below, identify if the velocity and acceleration are positive or negative and state if the object is slowing down, speeding up or moving with constant velocity.

Particle Model	Velocity (positive/ negative)	Acceleration (positive/ negative/ zero)	Speeding/ Slowing/ Constant Velocity
	Positive	Positive	Speeding
	Negative	Positive	Slowing
	Positive	Negative	Slowing

2. Three objects A, B *and* C are moving to the **right** with different speeds. The particle model for their motions are represented by the diagram below, where the time interval between consecutive dots is 1 second.



a. Complete the table by identifying the object (A, B or C) for each of the descriptions below.

Description	Object
Speeding up	B
Acceleration to the left	C
Constant velocity	A
Acceleration to the right	B
Zero acceleration	A
Slowing down	C

b. One of the objects above starts from rest and accelerates to 12 m/s in 3.0 s. Find its average acceleration.

$$a = \frac{\Delta v}{\Delta t} = \frac{12\ m/s - 0}{3.0s} = 4.0\ m/s^2$$

c. Using the SI units check if the equation ($x = \frac{1}{2}at^2$) is dimensionally correct. Consider x as the distance, a as the acceleration, and t as the time.

$Unit\ of\ distance,\ x = m$
$Unit\ of\ acceleration,\ a = m/s^2$
$Unit\ of\ time,\ t = s$
$\therefore Unit\ for\ \frac{1}{2}at^2 = \left(\frac{m}{s^2}\right) \times s^2 = m \implies same\ as\ unit\ for\ x$

3. Answer the following questions on acceleration.

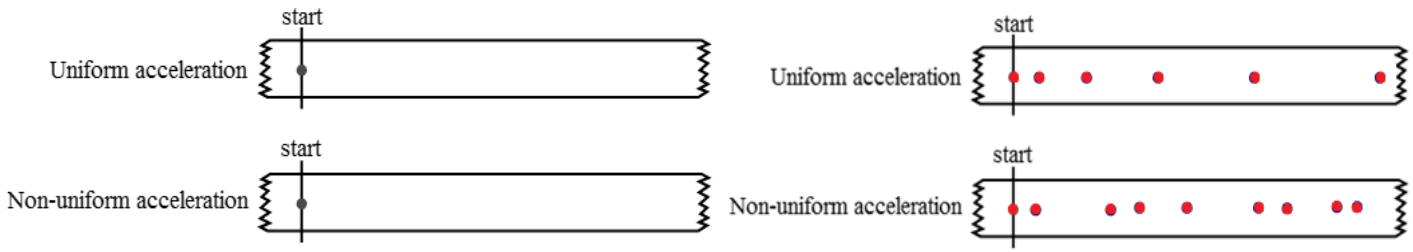
a. The particle model for the motion of a disk moving from left to right under different conditions is shown in the table below. The time interval between images is constant. Assuming that the direction to the right is positive, identify the types of motion in each model.

Motion	Type of Motion (acceleration is positive, negative or zero)
	Acceleration is negative
	Zero acceleration
	Acceleration is positive

b. The table below gives the directions of the initial velocity and acceleration for different motions. Complete the table by stating if the object is **speeding up**, **slowing down**, moving with **constant velocity** or is **at rest**.

Initial Velocity (v_i)	Acceleration (a)	Motion (speeding, slowing, constant velocity, at rest)
+	+	Speeding
−	−	Speeding
+	−	Slowing
−	+	Slowing
$-\ or\ +$	0	Constant velocity
0	$-\ or\ +$	Speeding from rest
0	0	At rest

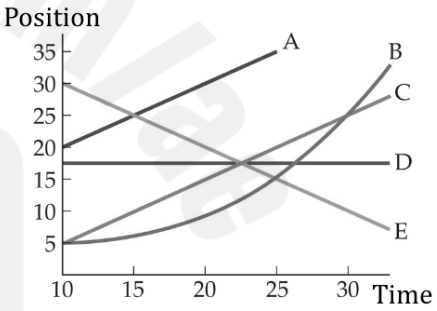
4. On the diagram below sketch two motions; one with uniform acceleration and the other with non-uniform acceleration using the particle model.



5. A car with an initial velocity of 16.0 m/s east slows uniformly to 6.0 m/s east in 4.0 s. What is the acceleration of the car during this 4.0 s interval?

$$a = \frac{\Delta v}{\Delta t} = \frac{6.0\frac{m}{s} - 16.0\frac{m}{s}}{4.0\ s}$$
$$a = -2.5\ m/s^2\ or\ 2.5\ m/s^2\ to\ the\ west$$

6. The figure below represents the position-time graph for four different objects A, B, C and D. Give a correct description of motion for each of the objects in the table below.



Object	Description
A	Positive, constant velocity
B	Positive increasing velocity/ Accelerating
C	Positive, constant velocity
D	At rest
E	Negative velocity

7. The biker below started moving from rest with a constant acceleration of 2.5 m/s^2.

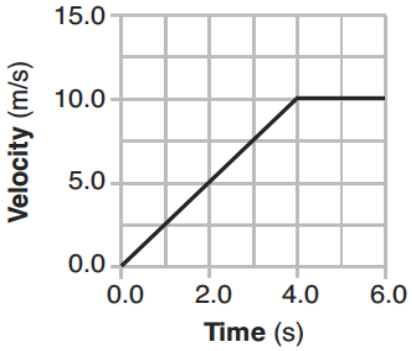
a. Calculate his speed after 3.0s.

$$a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{\Delta t}$$
$$v_f = v_i + a\Delta t = 0 + (2.5 \times 3.0) = 7.5\ m/s$$

b. Find the change in his speed between $t = 4s\ and\ t = 5s$?

$$\Delta v = a\Delta t$$
$$\Delta v = 2.5 \times 1 = 2.5\ m/s$$

8. The graph below represents the motion of a car during a 6.0 s time interval.



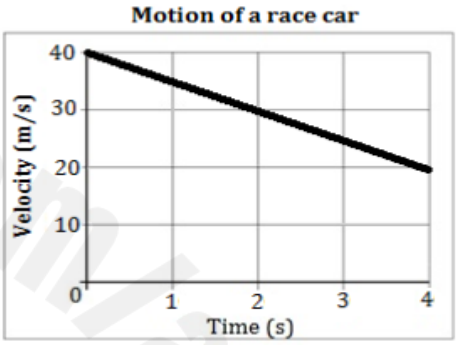
a. Calculate the total displacement of the car during the 6.0 s interval.
$Total\ displacement\ (\Delta x) = area\ under\ the\ graph$

$$\Delta x = \left(\frac{1}{2} \times 4.0 \times 10\right) m + (6.0 - 4.0)10m = 20\ m + 20\ m = 40\ m$$

b. Calculate the average velocity of the car during the 6.0s.

$$v_{av} = \frac{\Delta x}{\Delta t} = \frac{40\ m}{6.0\ s} = \frac{20}{3}\ m/s$$

9. The graph below represents the motion of a race car during a time interval of 4 seconds.



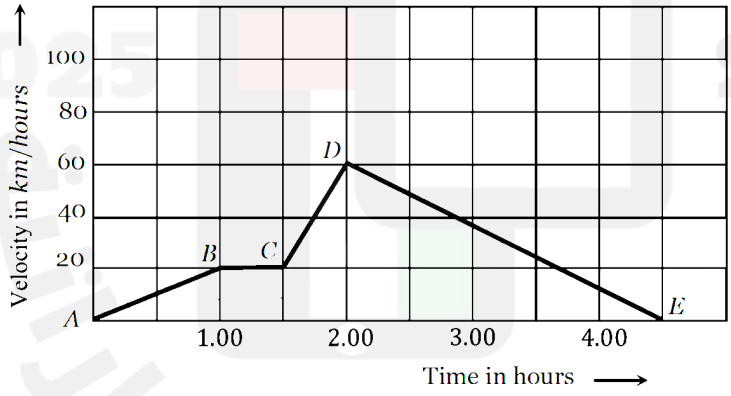
a. What is the speed of the car at $t = 3\ s$.
$v = 25\ m/s$

b. Describe the motion of the car.
The car is slowing down at a constant negative acceleration.

c. Calculate the acceleration of the car.

$$a = slope = \frac{\Delta v}{\Delta t} = \frac{20 - 40}{4 - 0} = -5\ m/s^2$$

10. A train moves from one station to another in 4.5 hours' time. Its velocity-time graph during this motion is shown in the figure below.



a. Describe completely, the motion of the train in terms of its velocity and acceleration in the regions indicated in the table below.

Region	Description of Motion	
	Velocity	Acceleration
BC	Constant, positive velocity	Zero acceleration
CD	Increasing, positive velocity	Constant, positive acceleration

b. Identify the region/ time for the following cases:

   i. Train moving with negative acceleration.
   In the region DE/ between 2.00 h to 4.50 h

   ii. Train moving with zero acceleration.
   In the region BC/ between 1.00 h to 1.50 h

c. Find the maximum acceleration of the train.

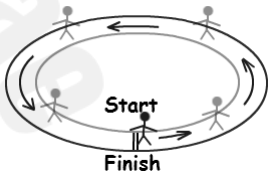
Maximum acceleration of the train is in the region CD

$$a = \frac{\Delta v}{\Delta t} = \frac{60\ km/h - 20 km/h}{2.00\ h - 1.50\ h} = -\frac{40\ km/h}{0.5\ h} = -80\ km/h^2$$

d. Find the distance covered by the train in the last 3 hours.

$$d = area\ of\ the\ trapezium\ (or\ triangle + rectangle) + area\ of\ the\ triangle$$
$$d = \left[\frac{1}{2}(20\ km/h + 60\ km/h)\ 0.5\ h\right] + \left[\frac{1}{2} \times 2.5\ h \times 60\ km\right]$$
$$d = 20\ km + 75\ km = 95\ km$$

11. The diagram shows a runner on a 200m circular path. He starts and finishes at the same point.



a. What is the runner's displacement?
The displacement is zero

b. The runner has a constant speed of 20m/s. Explain whether or not he is accelerating.
He is accelerating. An object which experiences either a change in the magnitude or the direction of the velocity vector can be said to be accelerating OR Here the direction of the velocity is changing, causing him to accelerate.