Science 10
PRACTICE EXAM
Chemistry and Physics

Name - Key - June 2018

INSTRUCTIONS

1. Write your first and last name on the line provided above.
2. All parts of the practice exam will be completed on this paper.

Part 1 – Multiple Choice

Circle the letter of the best answer.

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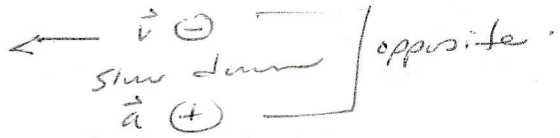
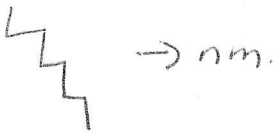
1. The *Certainty Rule* is used to
   (a) determine the number of significant digits when adding and subtracting measured values
   (b) determine the number of significant digits when adding and multiplying measured values
   (c) determine the number of significant digits when subtracting and dividing measured values
   (d) determine the number of significant digits when multiplying and dividing measured

2. You are riding your bicycle west. If you decide to decrease your velocity (slow down), in what direction is your acceleration?
   (a) south
   (b) north
   (c) east
   (d) west



3. Which list includes only nonmetals?
   (a) krypton, nitrogen, helium, xenon
   (b) titanium, zinc, copper, lead
   (c) gold, mercury, carbon, iron
   (d) nickel, platinum, chlorine, aluminum



4. Which of the following includes only scalar quantities? physical quantities with magnitude only
   (a) displacement, acceleration and velocity
   (b) distance, time, and speed
   (c) position, displacement and speed
   (d) displacement, speed and velocity

5. A family in the periodic table that contains only nonmetals is the
   (a) actinides
   (b) alkali metals
   (c) lanthanides
   (d) halogens

6. Which substance in the following list is an element?
   (a) ammonia NH_3
   (b) methane CH_4
   (c) bismuth Bi
   (d) water H_2O

7. When the following equation is balanced, the numerical coefficients for S_8 and I_2 are respectively:

$$1\ S_8 + 2\ I_2 \longrightarrow 4\ S_2I$$

   (a) 2, 8
   (b) 8, 2
   (c) 1, 2
   (d) 2, 1

8. In 1997, Thrust SSC, the world's fastest jet-engine car, travelled 604 m at an average speed of 341 m/s. The length of time it took was
   (a) 0.565 s
   (b) 1.77 s
   (c) 263 s
   (d) 945 s

$v_{av} = \frac{d}{t}$

$t = \frac{d}{v_{av}} = \frac{604\,m}{341\,m/s}$

9. If Cl_2 and Na_2S solutions are mixed together, a
   (a) double replacement reaction occurs
   (b) single replacement reaction occurs
   (c) decomposition occurs
   (d) synthesis reaction occurs

$Cl_2 + Na_2S \rightarrow$

ele cpd

10. A speed of 2.8 m/s is equal to
   (a) 0.78 km/h
   (b) 5.6 km/h
   (c) 10 km/h
   (d) 14 km/h

$2.8\frac{m}{s} \times 3.6 = 10\frac{km}{h}$

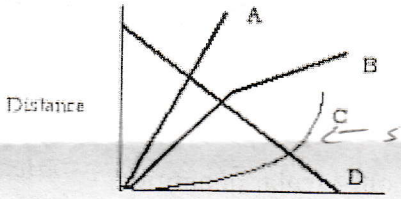
11. An atom becomes an ion with a charge of -2 when it:
   (a) gains 2 protons
   (b) loses 2 neutrons
   (c) loses 2 electrons
   (d) gains 2 electrons

gains $2e^-$

12. Which of the following is an example of speed?
   (a) 40 km
   (b) 20 km/h[E]
   (c) 1.5 m [right]
   (d) 15 km/h

How fast

13. Which of the following graphs illustrates an object that is speeding up?



C ← slope is changing

(a) A
(b) B
(c) C
(d) D

14. Which element is a member of the halogens?
(a) astatine
(b) copper
(c) radium
(d) potassium

15. Protons are
(a) negatively charged particles found outside the nucleus of an atom.
(b) neutral particles found in the nucleus of an atom.
(c) positively charged particles found outside the nucleus of an atom.
(d) positively charged particles found in the nucleus of an atom.

16. What type of reaction does the following equation represent?

$$AB + CD \rightarrow CB + AD$$

cpd cpd.

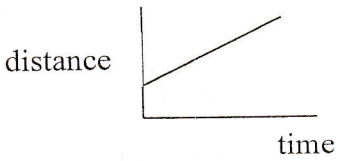
(a) single displacement
(b) combustion
(c) double displacement
(d) decomposition

17. A beryllium ion has
(a) 4 protons, 6 electrons and an ionic charge of 2-.
(b) 4 protons, 2 electrons and an ionic charge of 2+.
(c) 4 protons, 6 electrons and an ionic charge of 2+.
(d) 4 protons, 2 electrons and an ionic charge of 2-.

Be $^{2+}$ ↓ lost $2e^-$ | Atomic # = 4 = # p^+

18. Which of the following is a chemical property?
(a) freezing
(b) burning
(c) dissolving
(d) boiling

19. A positive slope on a distance-time graph indicates:
(a) the object's speed is increasing.
(b) the object is not moving.
(c) the object's speed is decreasing.
(d) the object has a constant speed.



20. The reaction below is an example of the reaction type called:

$$A + B \longrightarrow AB$$

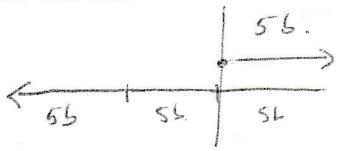
ele ele cpd.

(a) combustion
(b) decomposition
(c) synthesis - formation
(d) single displacement

21. An element that does form a diatomic molecule is
(a) iodine
(b) sulfur
(c) phosphorous
(d) sodium

Never fear ice cold ~~eats~~ broccoli.

22. John walks to his friend's house 5 blocks east and then walks 15 blocks west to his own home. His displacement is
(a) 10 blocks
(b) zero blocks
(c) 10 blocks [E]
(d) 10 blocks [W]



23. A measurement of 0.020 km has
(a) 2 significant digits
(b) 4 significant digits
(c) 5 significant digits
(d) 6 significant digits

24. If 1 min = 60 s, then 42 s equals
(a) 12 min
(b) 0.70 min
(c) 178 min
(d) 2520 min

$42\,s \times \frac{1\,min}{60\,s} = 0.70\,min$

25. The slope of a distance-time graph will determine the
(a) distance of the object
(b) speed of the object
(c) acceleration of the object
(d) displacement of the object

26. Acceleration can best be defined as
(a) the speed at which an object is travelling at a particular instant
(b) the displacement of an object divided by time
(c) the total distance covered over the total time measured
(d) the rate of change in velocity

27. In any chemical reaction, the total mass of the reactants is always equal to the total mass of materials produced. This is known as the law of:
(a) chemical reactions
(b) conservation of mass
(c) constant proportion
(d) conservation of energy

28. Which chemical formula correctly matches the chemical name provided?
(a) $Ni_2(SO_4)_3$ – nickel (III) sulfate
(b) $PbCO_3$ – lead (IV) carbonate
(c) $Fe(ClO_3)_2$ – iron (III) chlorate
(d) Cu_2PO_4 – copper (I) phosphate

Ni^{3+} $(SO_4)^{2-}$
2 3

29. A vector quantity has
(a) direction
(b) size
(c) size and direction
(d) none of the above

Size = magnitude

30. Which of the following is a molecular compound held together by covalent bonds?
(a) LiBr
(b) CaO
(c) H_2O
(d) Mg_3P_2

Part 2 – Atoms and Ions

Complete the chart below.

Element Name	Atomic Number	Ion Name	Ion Symbol	# of Electrons in the Ion
radon	86	X	X	X
technitium	43	technitium ion	Tc^{7+}	36
phosphorous	15	phosphide ion	P^{3-}	18

Part 3 – Compounds

starts with a metal/ion or $(NH_4)^+$

State whether each compound is ionic or molecular and give the compound name or chemical formula as required.

	Ionic or molecular	Name or Formula
a) $CrBr_3$	I	Chromium (III) bromide
b) $BeSO_4$	I	beryllium sulfate
c) AlI_3	I	aluminum iodide
d) FI_3	M	fluorine triiodide
e) cobalt (III) sulfide	I	$Co^{3+}S^{2-} \rightarrow Co_2S_3$
f) gallium phosphide	I	$Ga^{3+}P^{3-} \rightarrow GaP$
g) dinitrogen tetraoxide	M	N_2O_4
h) potassium dichromate	I	$K^+(Cr_2O_7)^{2-} \rightarrow K_2Cr_2O_7$

Part 4 – Identifying and Balancing Reactions

Balance the following equations and state the type of each reaction: formation (F), decomposition (D), single replacement (SR), double replacement (DR) or combustion (C).

Type

a) ____ $CrCl_2$ → ____ Cr + ____ Cl_2 (cpd, ele) — D

b) 2 KBr + ____ $Mg(NO_3)_2$ → 2 KNO_3 + ____ $MgBr_2$ (cpd, cpd) — DR

c) ____ C_5H_{12} + 8 O_2 → 5 CO_2 + 6 H_2O (10, 6) — C

d) 4 Co + 3 O_2 → 2 Co_2O_3 (ele, ele, cpd) — F

e) ____ Zn + ____ Na_2SO_4 → 2 Na + ____ $ZnSO_4$ (ele, cpd, ele, cpd) — SR

f) 1 C_4H_{10} + 13 O_2 → 8 CO_2 + 10 H_2O (2, 13, 8, 10) — C

Part 5 – Translating Word Equations to Balanced Chemical Equations

Use the following word equations to write balanced chemical equations.

1. Copper metal and phosphorus combine to form copper (II) phosphide.

Cu P_4 $Cu^{2+}P^{3-}$

$$6\,Cu + P_4 \rightarrow 2\,Cu_3P_2$$

2. Beryllium hydroxide and potassium nitrate react to form beryllium nitrate and potassium hydroxide.

$Be^{2+}(OH)^-$ $K^+(NO_3)^-$ $Be^{2+}(NO_3)^-$ $K^+(OH)^-$

$$Be(OH)_2 + 2KNO_3 \rightarrow Be(NO_3)_2 + 2KOH$$

3. Zinc metal and chromium (III) nitrate combine to form zinc nitrate and chromium metal.

Zn $Cr^{3+}(NO_3)^-$ $Zn^{2+}(NO_3)^-$ Cr

$$3\,Zn + 2\,Cr(NO_3)_3 \rightarrow 3\,Zn(NO_3)_2 + 2\,Cr$$

Part 6 – Predicting Products

Omit Part 6

Part 7 – Physical Quantities

Complete the chart below. Choices are provided in some of the headers.

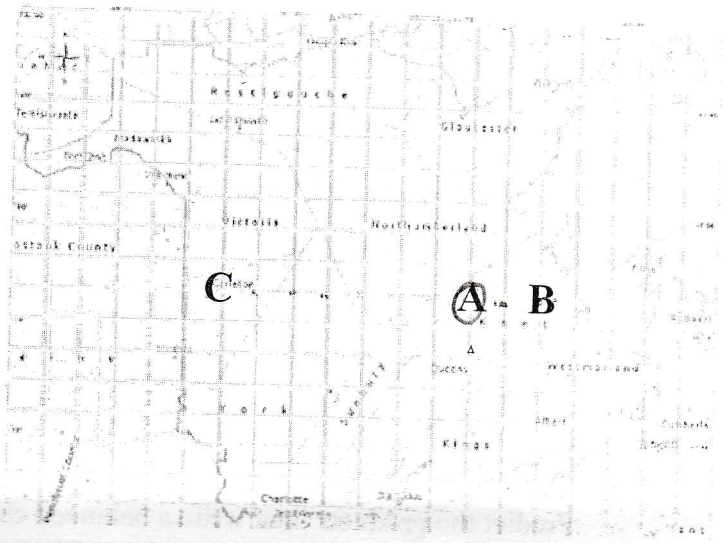
Physical Quantity	Type of Physical Quantity (scalar or vector)	Variable	Unit (s, m, m/s, m/s^2)
acceleration	vector	$\vec{a}$	m/s^2
distance	scalar	d	m
velocity	vector	$\vec{v}$	m/s
position	vector	$\vec{d}$	m
speed	scalar	v	m/s
displacement	vector	$\Delta\vec{d}$	m
time	scalar	t	s

Part 8 – Position, Displacement, Velocity and Acceleration

1. a) Using **A** as your reference point, state the position of each letter below. Include signs to represent directions: + for a positive direction and – for a negative . No units are required in this case.

(i) **B** $\vec{d}$ = +2 (i)

(ii) **C** $\vec{d}$ = -7 (f)



b) If an object moves from **B** to **C**, what is the object's displacement? Show a calculation – see the formula sheet for the defining equation for displacement. A word statement is not required.

(i) (f)

$\vec{d}_i = +2$

$\vec{d}_f = -7$

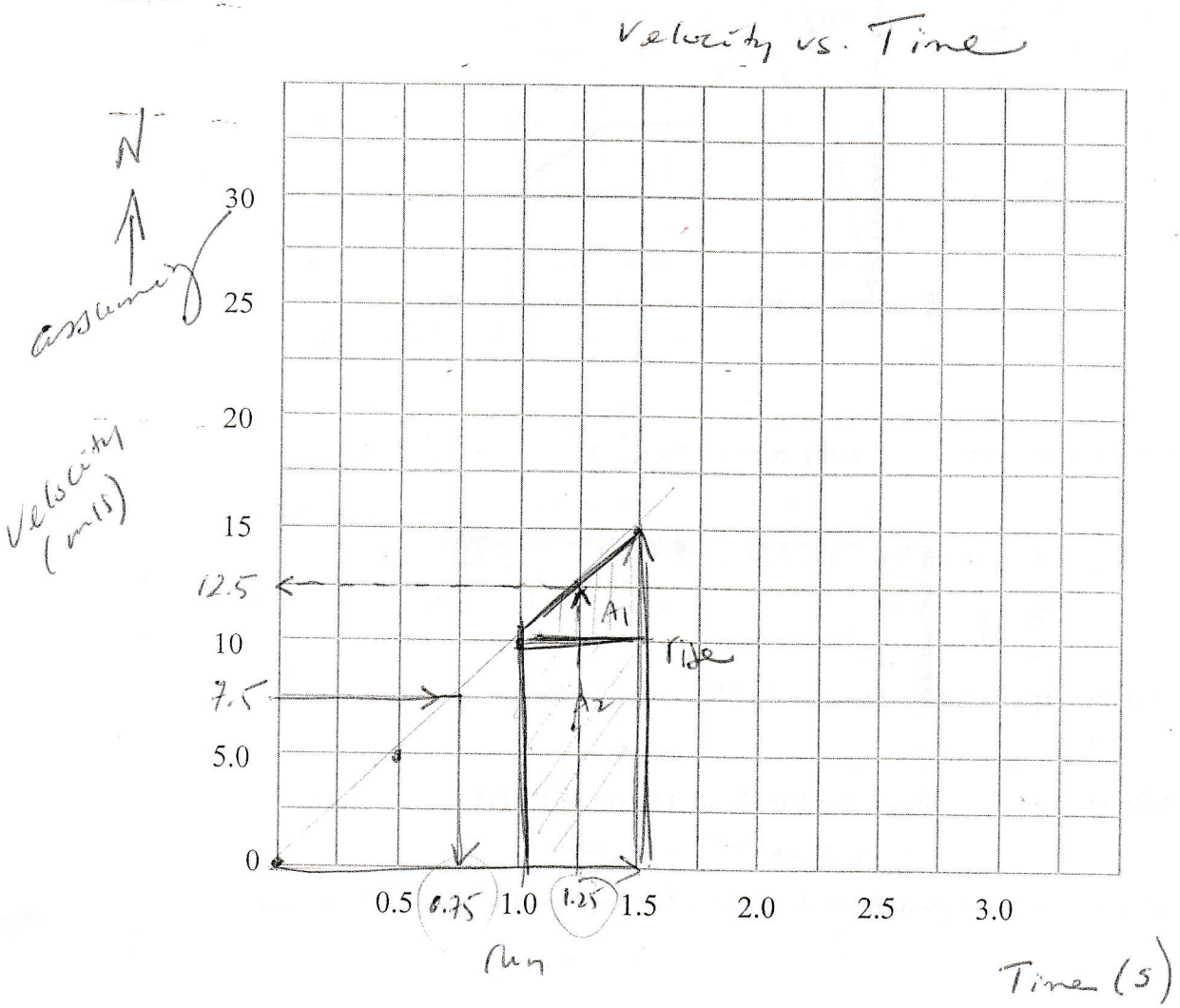
$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\Delta\vec{d} = -7 - (2)$

$\Delta\vec{d} = -9$ ✓

2. Data was collected for an object in motion. Draw a velocity-time graph for the data in the chart. Remember to include a title for the graph, labels for the axes and a line of best-fit.

Time (s)	Velocity (m/s)
0.0	0.0
0.5	5.0
1.0	10
1.5	15



a) i) How fast was the object moving at t = 1.25 s?

12.5 m/s

ii) At what t value would the object be travelling at 7.5 m/s?

0.75 s

b) What was the object's acceleration? Report answer to 2 SDs.

↓ Slope

$\vec{a} = \frac{15\ m/s}{1.5\ s} = +10\ m/s$ — 10 m/s North

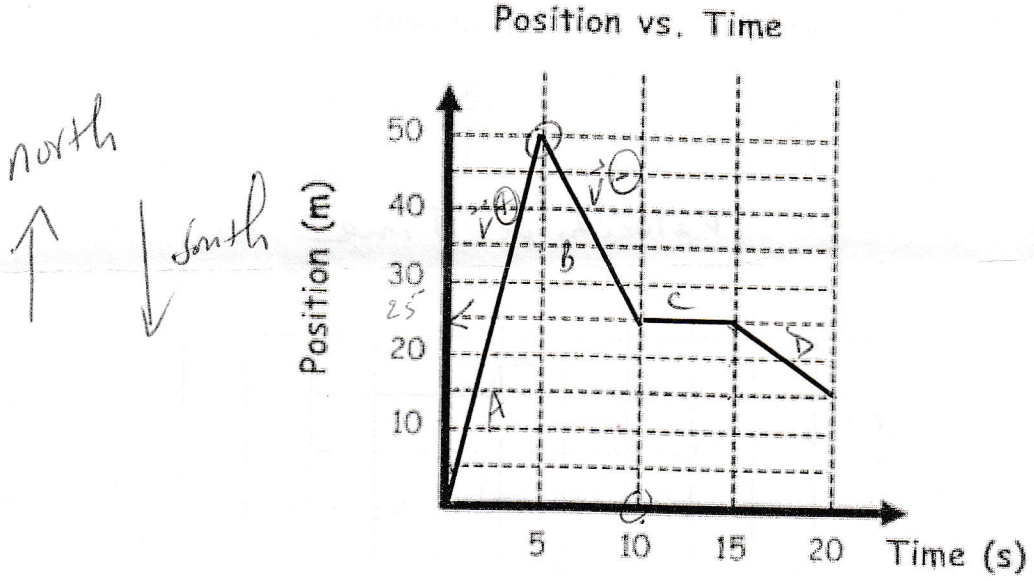
c) What was the object's displacement between 1.0 s and 1.5 s? Report answer to 2 SDs.

$A_1 = \frac{1}{2}(0.5)(5) = +1.25\ m$

$A_2 = (0.5)(10) = +5.0\ m$

$\vec{\Delta d} = 1.25 + 5.0 = +6.3\ m$

3. Answer the questions below using the position versus time graph provided for an object traveling in a straight line. Assume the positive direction is north.



a) What is the position of the object at t = 10 s? **(1)**

25 m, north.

b) What was the object doing between t = 0 s and t = 5 s? **(2)**

moving with constant velocity northward.

c) Did the object change directions? If so, when? **(1)**

Yes, t = 5s.

d) What was the maximum displacement of the object? **(1)**

50m, north.

e) What type of motion did the object have between t = 15 s and t = 20 s? **(1)**

uniform motion

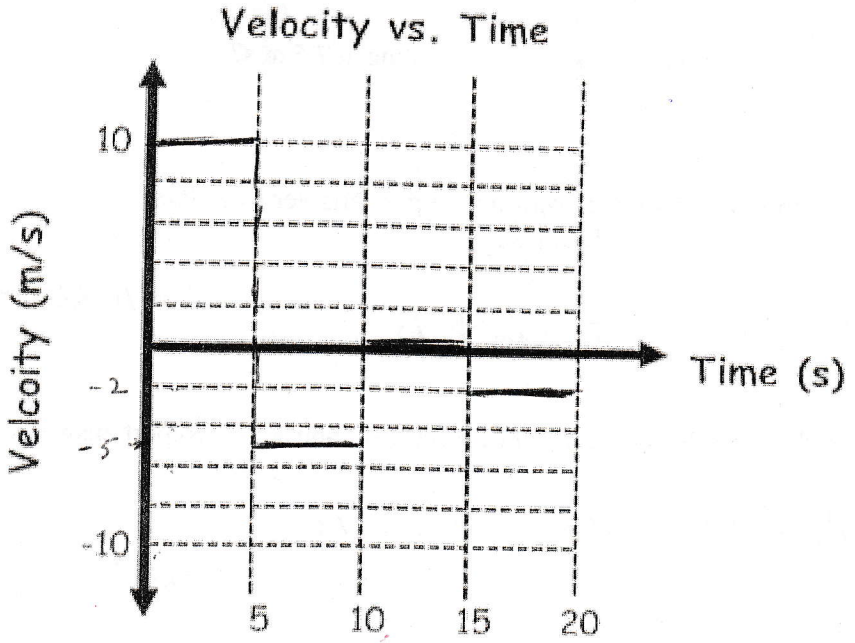
f) Draw the velocity-time graph for the object on the grid below. **(4)**

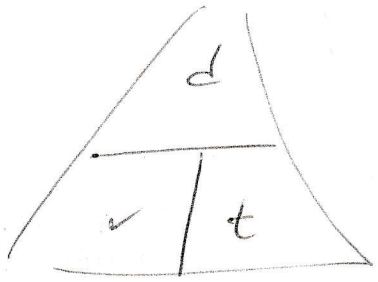
A: $\frac{50m}{5s} = 10m/s$

B: $\frac{-25m}{5s} = -5m/s$

C: $0m/s$

D: $\frac{-10m}{5s} = -2m/s$





Part 9 – Word Problems

Show work for full value. Include a word statement.

1. A hot air balloon flew 12 h at an average speed of 210 km/h. How far did it travel?

$d = ?$

$t = 12\ h$

$v_{av} = 210\ \frac{km}{h}$

$v_{av} = \frac{d}{t}$

$d = v_{av} t$

$d = \left(210\ \frac{km}{h}\right)(12\ h)$

$d = 2.5 \times 10^3\ km$

The hot air balloon travelled 2.5×10^3 km.

2. A race car accelerates at 5.0 m/s^2 [W]. What was the initial velocity of the race car if its velocity after 2.7 s was 37 m/s [W]?

$\vec{a} = -5.0\ m/s^2$

$\vec{v}_i = ?$

$t = 2.7\ s$

$\vec{v}_f = -37\ m/s$

$\vec{a} = \frac{\vec{v}_f - \vec{v}_i}{t}$

$\vec{v}_f = \vec{v}_i + \vec{a}t$

$\vec{v}_i = \vec{v}_f - \vec{a}t$

$\vec{v}_i = \left(-37\ \frac{m}{s}\right) - \left(-5.0\ \frac{m}{s}\right)(2.7\ s)$

$\vec{v}_i = -24\ m/s$

The initial velocity of the race car was 24 m/s [W].

3. A truck is travelling at 22 m/s east when the driver notices a speed limit sign for the town ahead. If it takes the driver 6.9 s to slow down to a velocity of 14 m/s east, what is the acceleration of the truck?

$\vec{v}_i = +22\ m/s$

$t = 6.9\ s$

$\vec{v}_f = +14\ m/s$

$\vec{a} = ?$

$$\vec{a} = \frac{\vec{v}_f - \vec{v}_i}{t}$$

$$\vec{a} = \frac{14\ m/s - (+22)\ m/s}{6.9\ s}$$

$$\vec{a} = -1.2\ m/s^2$$

The acceleration of the truck was $1.2\ m/s^2$, west.

4. A student travels at a constant velocity of 0.38 m/s [E]. How long did it take the student to travel 3.0 m [E]?

$\vec{v} = +0.38\ m/s$

$t = ?$

$\vec{\Delta d} = +3.0\ m$

$\vec{v} = \frac{\vec{\Delta d}}{t}$

$t = \frac{\vec{\Delta d}}{\vec{v}}$

$t = \frac{+3.0\ m}{+0.38\ m/s}$

$t = 7.9\ s$

CH took the student 7.9s.

5. The peregrine falcon is the fastest of the flying birds. If a peregrine falcon can fly 1.73 km downward in 25 s, what is the average velocity of the bird in km/h?

(-) d_r

$\vec{\Delta d_r} = -1.73\ km$

$t = 25\ s$

$\vec{v_{av}} = ?\ (\frac{km}{h})$

$25\ s \times \frac{1\ h}{3600\ s} = 0.0069\ h$

$\vec{v_{av}} = \frac{\vec{\Delta d_r}}{t}$

$\vec{v_{av}} = \frac{-1.73\ km}{0.0069\ h}$

$\vec{v_{av}} = 02.5 \times 10^{2}\ \frac{km}{h}$

The average velocity of the bird was $2.5 \times 10^{2}\ \frac{km}{h}$, down.