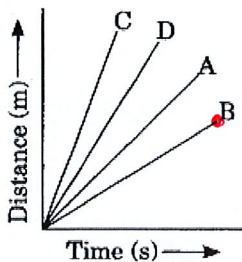# SCIENCE Semester 1   Practice exam TWO   /54

1. Four cars A, B, C, and D are moving on a levelled road. Their distance versus time graphs is shown in the adjacent figure. Choose the correct statement.

(a) Car A is faster than car D.
(b) Car B is the slowest.   — *lowest dist, highest time*
(c) Car D is faster than car C.
(d) Car C is the slowest.
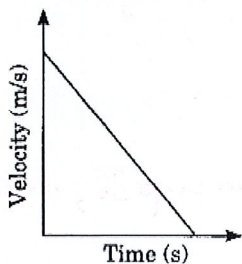
2. Which of the following is a correct measure of velocity?
   (a) 30 s
   (b) 30 m/s
   (c) 30 South
   (d) 30 m/s, South   — *value (scalar) + direction (vector)*

3. The velocity-time graph of an object is given below. The object has

(a) Constant velocity
(b) Constant speed
(c) Constant acceleration — *its velocity is changing (reducing) at a constant rate.*
(d) Varying acceleration

4. Velocity is defined as _____ per time.
   a. distance
   b. displacement
   c. power
   d. acceleration

~~50 mark~~ *leave in*

5. What is the net force on an 800-kg airplane flying with a constant velocity of ~~160 km/hour~~ north?
   a. zero
   b. 160 N
   c. 800 N
   d. 128 000 N

"Trick Q"
zero acceleration so $F = m \times a$
$= m \times 0$
$= 0$

6. The same net force is applied to object A and object B. The observed accelerations of the two objects are not the same; object A has an acceleration three times that of object B. Which of the following is correct?

    a. Object A has three times the mass of object B.
    b. Object A has one-third the mass of object B.
    c. Object A has a different, less streamlined shape than object B.
    d. Object A has more friction than object B.

b [handwritten, b circled]

7. In the diagram of the rollercoaster on the right, at which point is potential energy greatest?

    a. W   — *highest.* [handwritten, a circled]
    b. X
    c. Y
    d. Z
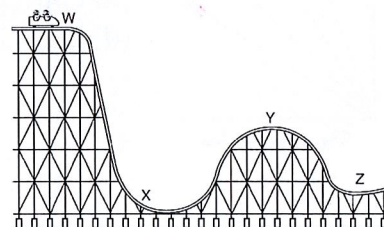
8. The significance of valence electrons in an atom is that valence electrons...

    a. Are equal in number to the protons in the nucleus
    b. Are the innermost ring of electrons around the nucleus
    c. Determine the chemical reactivity of the atom — *no. of electrons lost or gained by valence shell determines chemical reactivity* [handwritten, c circled]
    d. Are the electrons lost by the atom in a chemical reaction

9. The alkali earth metals are:

    a. The rarest of metals
    b. Group 1 on the periodic table.
    c. Metals which lose two electrons in chemical reactions with non-metals — *group II, metals.* [handwritten, c circled]
    d. The most reactive metals in the periodic table

10. The chemical formula for calcium sulphate is

    a. $Ca^{2+}SO_4^{2-}$
    b. $Ca_2(SO_4)_2$
    c. CaS
    d. $CaSO_4$ — *Ca^{+2} and SO_4^{2-}, 1 of each creates balanced charges* [handwritten, d circled]

(10 marks)

11. In a science lesson, some children float an apple on some water. One of the children says: "The apple is not moving. That means that there cannot be any forces acting on it."
Do you agree? Explain your answer as fully as you can.

Not true, forces are acting (½)
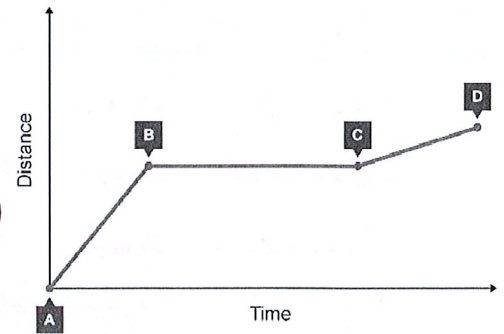
gravity & boyancy (½)
are equal (½)
and opposite
so cancel out (½)

or

(½) unbalanced forces cause acceleration
(½) balanced forces cause constant motion/velocity
(½) so forces are balanced on apple.

(2 marks)

12. The graph shows the distance a person walked on a short journey.

In as much detail as you can describe the journey of the person

A-B : Walked at constant speed/vel. (1)

B-C : stationary/stopped (½)

C-D : walked at constant speed (½) slower than A-B (1)

(3 marks)

13. A car travels 65 km in a northerly direction and then turns East and travels 25 km. the entire journey takes 1 hour. Calculate
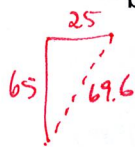
a. the speed of the car.

$S = \dfrac{d}{t} = \dfrac{90 \, km}{1 \, hr} = 90 \, km/hr$

(½) (½) (½)

(1½ mark)

b. The velocity of the car in metres per second

$65 \overline{)69.6} \quad 25$

$v = \dfrac{s}{t} = \boxed{\dfrac{69.6 \, km}{1 \, hr}} = 69.6 \, km/hr \div 3.6 = \underline{19.3 \, m/s}$

(½) (½) (½) (½)

(2 mark)

14. A motorbike accelerates from rest at 2.8 m/s/s for 11 seconds.
   a. What is the final velocity of the motorcycle?

$a = \dfrac{v - u}{t}$ or $v = at + u = 2.8 \, m/s/s \times 11 + 0 = 30.8 \, m/s$

(½) (½) (½)

(1½ mark)

b. What is this velocity in km/hr?

$30.8 \, m/s \times 3.6 = 110.9 \, km/hr$

(½) (½)

(1 mark)

15. A trolley with a mass of 200 kg collides into a wall and accelerates (negatively) at -25 m/s/s. What was the force with which the trolley hit the wall?

$F = m \times a = 200 \, kg \times 25 \, m/s/s = 5000 \, N$

(½) (½) (½)

(1½ mark)

16. Use your knowledge of Newton's first law of motion to explain why it is dangerous to leave heavy objects lying unsecured (not tied down) in the back of a car.

Correctly state 1st Law of motion ①
Correctly state. what external forces are applied to ①
AND consequences.
Correctly state what does NOT have ex. forces
applied AND consequences ①

(3 mark)

17. A 500 g ball is dropped from a 75 metre building. What will be its velocity when it hits the ground?

$E_{GP} = m \times g \times h = 0.5 \times 9.8 \times 75 = 367.5 \text{ J}$ ①

E_{GP} at top of building = E_k at bottom of building ①

$E_k = \frac{1}{2} m v^2$ or $v = \sqrt{\frac{E_k}{\frac{1}{2} m}} = \sqrt{\frac{367.5 \text{ J}}{\frac{1}{2} \times 0.5}} = 38.3 \text{ m/s}$ ①

(3 mark)

18. Write definitions for

a. Molecule — two or more atoms ② chemically bonded ②

b. Noble gases — group 8 (½) chemically inert (½)

c. Atomic number — no of protons in the nucleus ①

(3 mark)
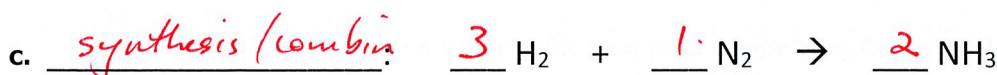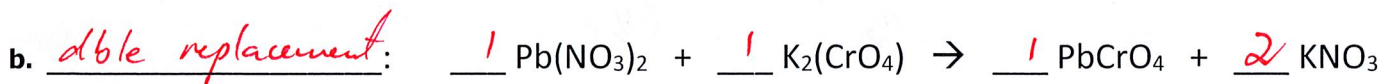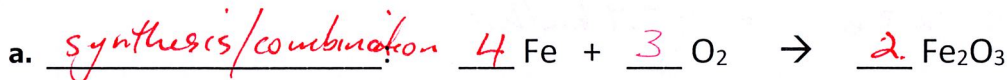
19. State the law of conservation of matter

matter cannot be created or destroyed (½)
in chemical reactions (½)

(1 mark)

20. For each of the reactions below identify the TYPE of reaction it is and balance the chemical equation.

a. synthesis/combination __4__ Fe + __3__ O₂ → __2__ Fe₂O₃

b. dble replacement: __1__ Pb(NO₃)₂ + __1__ K₂(CrO₄) → __1__ PbCrO₄ + __2__ KNO₃

c. synthesis/combin: __3__ H₂ + __1__ N₂ → __2__ NH₃

(7½ mark)

21. Write a balanced chemical equation for a double displacement reaction between Sodium chloride and Aluminium hydroxide.

__3 NaCl__ + __Al(OH)₃__ ⟶ __3 NaOH__ + __AlCl₃__

① (½)   (½)   ① (½)   (½) (4 mark)
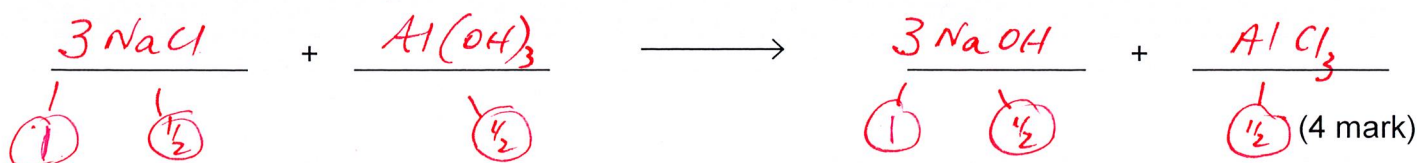
22. Explain how temperature and surface area can change the rate of a chemical reaction.

a. temperature   _increasing temp increases speed of particles (½)_
   inc the speed inc the no. of collisions (1) inc the rate(½)

b. surface area   _inc the S.A means more particles can collide (1)_
   means more collisions occur (½) inc the rate(½)

(4 marks)

23. A student performed an experiment in which they investigated if changing the temp of a reaction affects the rate of a reaction. The reaction investigated was magnesium metal reacting with hydrochloric acid. The reaction produces hydrogen gas, so the rate of the reaction was measured by how quickly hydrogen gas was produced. The student did the experiment at three different temperatures; 25^0C, 65^0C, and 80^0C. the results of the reaction are shown below in the table.

Time (s)	Volume of hydrogen gas produced (cm³)		
	25°C	60°C	80°C
0	0	0	0
10	17	32	31
20	30	46	50
30	39	57	60

a. List the independent and the dependent variables for the reaction.

   temp = ind ①   _volume of gas or Rate_ ①

(2 marks)

b. Describe, in one sentence, the relationship between temperature and the rate of reaction which is shown in the data within the table..

   as temp inc, the rate of reaction increases
   ① (½) (½)

(2 marks)

c. List two variable which would have been controlled by the student during this experiment.

   amount of Mg
   volume of HCl   } _any two of ① each_   (2 marks)
   conc of HCl

HARDER Q : $a = \dfrac{v-u}{t} = \dfrac{12.3\,u/s - 1.5\,u/s}{6.5}$ $F = m \times a = 1200\,kg \times 1.66$
                                                                      $= 1992\,N$ of net force.
                          $\approx 1.66\,m/s/s$