Mock 2020 (Feb 15)

Part A
Multiple Choice
Each question is worth 4 marks

Question 1

A miniature boat race was held on a pond. The following table gives information about the distance covered by each boat at different moments during the race.

Distance covered by each boat in relation to time.

Boat	Distance Covered (m)	Time (s)	m/s
A	9	5	1.8
B	6	4	1.5
C	12	9	1.$\bar{3}$
D	16	10	1.6

Which boat had the highest average speed?

A) Boat A B) Boat B C) Boat C D) Boat D

Question 2

The table below describes the planet Mars as compared to the planet Earth.

Topography: similar to that of the Earth (valleys, dunes, volcanoes, mountains)
Radius: smaller radius than Earth
Distance from Sun: farther from the Sun than the Earth
Mass: one tenth of the mass of Earth

lower gravity

Which hypothesis is the most plausible when it comes to the weight of an object on Mars compared with its weight on Earth?

A) The weight of an object on Mars is greater than it is on Earth, since Mars is farther away from the Sun. The gravitational force is therefore greater on Mars.

B) The weight of an object on Mars is greater than it is on Earth because the radius of Mars is smaller than the radius of the Earth. The gravitational force is therefore greater on Mars.

C) The weight of an object on Mars is less than it is on Earth, since Mars is smaller and has a smaller mass. The gravitational force is therefore lower on Mars.

D) The weight of an object on Mars is the same as it is on Earth, since the topography of Mars is similar to that of Earth. The gravitational force is therefore more or less the same on both planets.

$E = P\Delta t \quad P = \frac{E}{\Delta t} = \frac{34200}{120} = 285\,W$

Question 6

An electric food mixer consumes 34 200J of energy when used for 2 minutes. What is the power of the food mixer?

A) 17.1 W B) 28.5 W C) 285 W D) 17 100 W

Question 7

Two objects are held under water. When the objects are released, one of them sinks to the bottom, while the other remains suspended in the water but does not float up.

Which of the following statements correctly explains why this happened, according to Archimedes' principle?

A) The weight of the object that sinks to the bottom is less than the buoyant force. ✗

B) The weight of the object that sinks to the bottom is equal to the buoyant force. ✗

C) The weight of the object suspended in the water is less than the buoyant force. ✗

D) The weight of the object suspended in the water is equal to the buoyant force.

Question 8

Alexandra leaves for work each morning at 7am. She can get to work by bus, metro, commuter train, or bicycle.

The following table gives information about the route she takes with each method of transportation.

Distance travelled and average speed with each method of transportation used

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

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

Method	Distance travelled	Average speed	
Bus	16.8 km	43.2 km/h	0.3$\bar{8}$h
Metro	14 000 m 14km	50 km/h	0.28
Commuter Train	11.7 km	48 km/h	0.24 *
Bicycle	8000 m 8 km	23 km/h	0.35

Which method of transportation allows Alexandra to get to work the earliest?

A) Bus B) Metro C) Commuter Train D) Bicycle

Question 3

A television is designed to transform electrical energy into a variety of usable forms of energy such as light and sound.

Over a certain period of time, a television may consume 450 kJ of electrical energy, but a total of 180 kJ of this amount is lost as heat.

What is the energy efficiency of this television?

450 - 180 = 270

A) 40% B) 60% C) 67% D) 71%

$\% E = \frac{\text{useful}}{\text{consumed}} \times 100 = \frac{270}{450} \times 100 = 60\%$

Question 4

In a game of tug-of-war, 9 children pull the rope in one direction with a force equal to 100N per child. Pulling the rope in the opposite direction, 3 adults apply an average force of 475N per person.

100 x 9 = 900

3x475 = 1425 1425 - 900 = 525 N

Which one of the 2 teams will win the tug-of-war?

A) The children have a greater chance of winning with a resultant force of 425N.

B) The children have a greater chance of winning with a resultant force of 575N.

C) The adults have a greater chance of winning with a resultant force of 375N.

D) The adults have a greater chance of winning with a resultant force of 525N.

Question 5

balloon ⊖ hair ⊕

After being rubbed on hair, a rubber balloon acquires an electrical charge. When a piece of positively charged cotton is brought close to the balloon, the two objects will attract each other.

What will happen to this balloon if it is brought close to a negatively charged plastic rod and why?

⊖ vs ⊖

A) The balloon will be repelled because it is positively charged.

B) The balloon will be repelled because it is negatively charged.

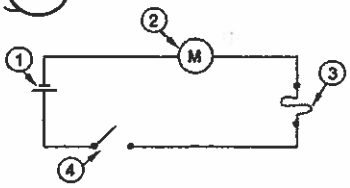
C) The balloon will be attracted because it is positively charged.

D) The balloon will neither be attracted nor repelled because it is neutral.

Question 9

The diagram below shows different components of an electrical circuit.

The symbol  represents a motor.



Which of the following choices correctly match the components with their function?

A) 1 - Power supply	2 - Energy transformation	3 – Control	4 - Protection
B) 1 - Power supply	2 - Energy transformation	3 – Protection	4 - Control
C) 1 - Energy transformation	2 - Power supply	3 – Control	4 - Protection
D) 1 - Energy transformation	2 - Power supply	3 – Protection	4 - Control

Question 10

Which of the following statements correctly describes the difference between the amounts of thermal energy of the water in the two beakers below?

200 mL of water at 25°C 400 mL of water at 25°C

A) There is more thermal energy in the 200 mL of water because the molecules have less room to move around.

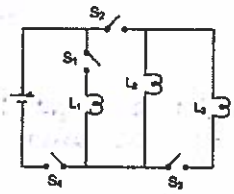
B) Both volumes of water have the same amount of thermal energy because their temperature is the same.

C) There is more thermal energy in the 400 mL water because there are more water molecules.

D) There is less thermal energy in the 400 mL of water because the molecules must travel a greater distance before colliding with one another.

Question 11

The circuit below has a power source, three light bulbs (L_1, L_2 and L_3) and four switches (S_1, S_2, S_3 and S_4)



What should you do so that only light bulb L_1 is on?

A) Close switch S_1.

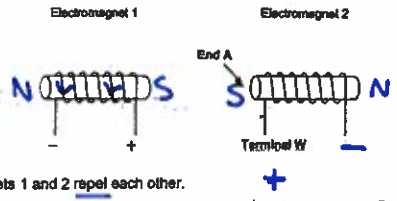
B) Close switch S_4.

C) Close switches S_1 and S_4.

D) Close all switches.

Question 12

The following diagram shows two current-bearing electromagnets.



Electromagnets 1 and 2 repel each other.

What is the polarity (+ or -) of Terminal W & what is the pole formed at End A (North or South)?

A) Positive polarity; North Pole

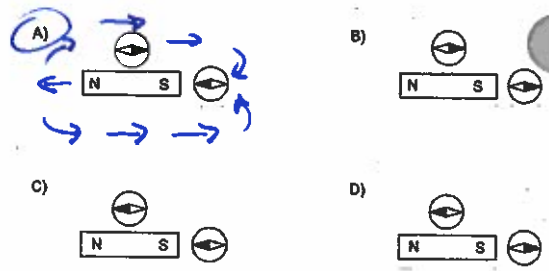
B) Positive polarity; South Pole

C) Negative polarity; North Pole

D) Negative polarity; South Pole

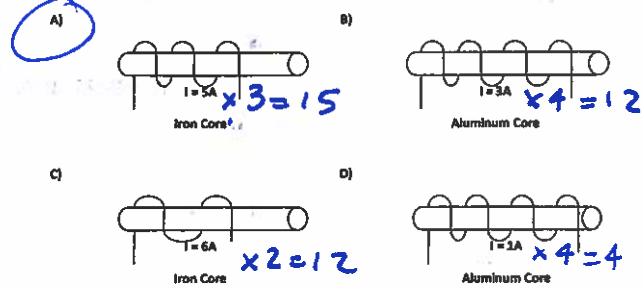
Question 13

Which diagram shows the needles of the two compasses pointing in the correct direction when they are placed near a bar magnet?



Question 14

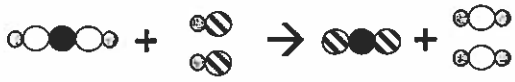
Which is the strongest electromagnet?



Q15 B must move wire perpendicular to magnetic field.

Question 16

The following model represents a balanced equation for a neutralization reaction.



If: ● represents magnesium (Mg) ○ represents oxygen (O)

○ represents hydrogen (H) represents bromine (Br)

Which of the following equations correctly represents this reaction?

A) $MgO_2H_2 + H_2Br_2 \rightarrow MgBr_2 + H_4O_2$

B) $Mg(OH)_2 + 2HBr \rightarrow MgBr_2 + 2H_2O$

C) $Mg(OH)_2 + 2HBr \rightarrow MgBr_2 + H_2O$

D) $MgO_2H_2 + 2HBr \rightarrow MgBr_2 + H_2O$