

June 2011

PART A  
MULTIPLE-CHOICE QUESTIONS

INSTRUCTIONS

ANSWER QUESTIONS 1 TO 15 IN YOUR ANSWER BOOKLET BY FILLING IN THE CORRECT SPACE.

1. With which living organism is primary productivity associated?

- A) A bee  **B) A tree**  C) A cow  D) An earthworm

2. A warm air mass meets a cold air mass.

What kind of weather occurs when these two air masses meet?

- A) Light showers  B) A hurricane  C) A sunny day  D) A heavy thunderstorm

3. The table below gives a list of disturbances. Some are natural, and others are the result of human activity.

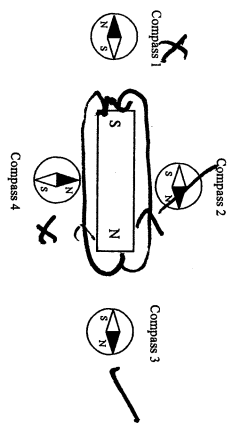
Table 1 – Different Possible Disturbances

Disturbances
1. Volcanic eruption
2. Acid rain
3. Snowstorm
4. Tree cutting
5. Forest fire

Which of these disturbances result from natural causes only?

- A) 1, 2 and 3  **B) 1 and 3**  C) 1, 3, 4 and 5  D) 2 and 5

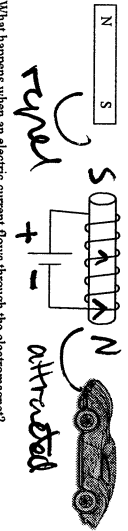
6. The following diagram shows a bar magnet and four compasses.



Which compass shows the needle pointing in the correct direction?

- A) Compass 1  B) Compass 2  **C) Compass 3**  D) Compass 4

7. The following diagram shows a magnet, an electromagnet and a small car containing iron.



What happens when an electric current flows through the electromagnet?

- A) The magnet and the car are attracted.   
 B) The magnet and the car are repelled.   
 C) The magnet is attracted, and the car is repelled.   
**D) The magnet is repelled, and the car is attracted.**

4. Tides are the rise and fall of water levels.

Which of the following statements is true?

- A) The height of the tides (tidal range) is always constant.  X  
 B) There is only one tide per day.  X  
**C) High tide occurs when the waters are on the side of the Earth facing the Moon.**   
 D) The tides are caused only by the position of the sun.  X

5. An electrical appliance has a defective resistor with a resistance of  $3\ \Omega$ . You are asked to replace this resistor.

The following table provides information about four resistors you have been given.

Table 1 – Potential Difference Across the Terminals of the Four Resistors and the Current Flowing Through Them

Resistor	Potential Difference (V)	Current (A)
1	2	0.4
2	6	0.5
3	15	2.5
4	20	2.0

Which one of these resistors should you use to replace the defective resistor?

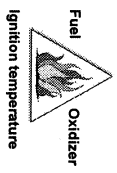
- A) Resistor 1   
 B) Resistor 2  
 C) Resistor 3  
 D) Resistor 4

$V=IR$   
 $V=R$   
 $I=1$   
 $5$   
 $15$   
 $10$

$F = mg$   
 $1.86 = 0.3 \times g$   
 $g = 3.72$

8. The weight of an object on Mars is  $1.86\ N$ . If the mass of this object is  $500\ g$ , what is the intensity of the gravitational field at the surface of Mars?  
 A)  $0.0037\ N/kg$   B)  $0.27\ N/kg$   **C)  $3.72\ N/kg$**   D)  $268.82\ N/kg$

9. A fire is extinguished by removing at least one of the three conditions required for combustion to occur. These conditions are indicated in the fire triangle below.



The following table describes three functions of a  $CO_2$  extinguisher.

Table 1 – Functions of a  $CO_2$  Extinguisher

1	The main function of the carbon dioxide ( $CO_2$ ) is to smother the fire by reducing the amount of oxygen gas ( $O_2$ ) that feeds it.
2	In the very early stages of a fire, the $CO_2$ has a cooling effect, since it comes out of the extinguisher at a temperature of $-79^\circ C$ .
3	The gas comes out of the extinguisher as a powerful spray that puts out small paper fires by scattering the pieces of material involved.

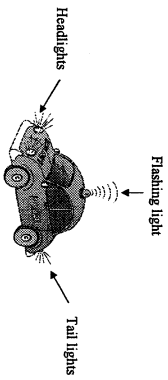
Which of the following shows the correct match between the numbered functions of the  $CO_2$  extinguisher and the conditions required for combustion to occur?

- A) 1- fuel  2- ignition temperature  3- oxidizer   
 B) 1- oxidizer  2- ignition temperature  3- fuel   
 C) 1- ignition temperature  2- oxidizer  3- fuel   
 D) 1- fuel  2- oxidizer  3- ignition temperature

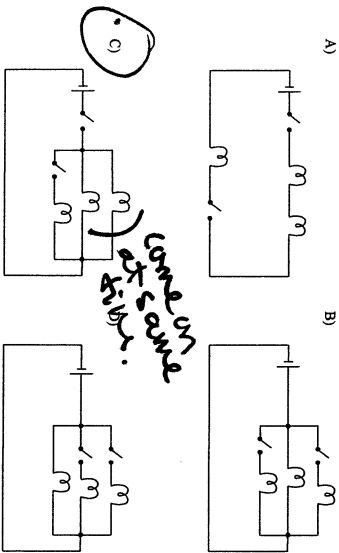
10. A battery-operated toy police car has 3 types of lights that can come on in different ways.

- The car has only one electrical circuit that controls the lights.
- The headlights and the tail lights come on when you start the car.
- If necessary, the flashing light can come on at the same time as the headlights and the tail lights.

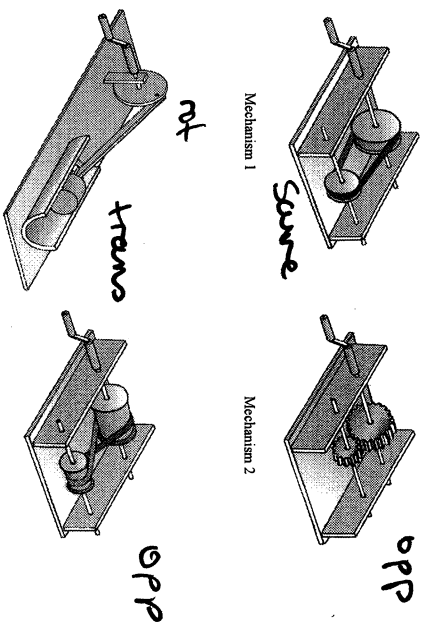
This toy police car is illustrated in the diagram below:



Which of the following diagrams represents the electrical circuit that can control the lights in this toy police car?



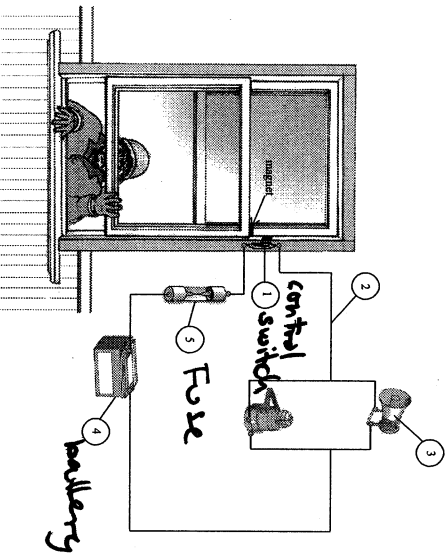
11. The following are diagrams of different mechanisms.



Which of these mechanisms make the driven component rotate in the direction opposite to that of the driver component?

- A) Mechanisms 1 and 3  
 B) Mechanisms 1 and 4  
 C) Mechanisms 2 and 3  
 D) Mechanisms 2 and 4

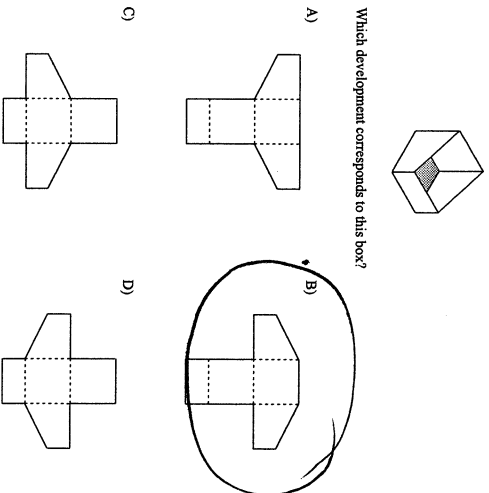
12. The electrical circuit of a magnetic alarm system is illustrated in the diagram below.



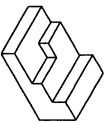
Which of the following shows the correct match between the five numbered components in this circuit diagram and their corresponding electrical functions?

- A) 1- control 2- conduction 3- transformation 4- power supply 5- protection  
 B) 1- control 2- conduction 3- power supply 4- transformation 5- protection  
 C) 1- power supply 2- protection 3- transformation 4- control 5- conduction  
 D) 1- power supply 2- conduction 3- protection 4- transformation 5- control

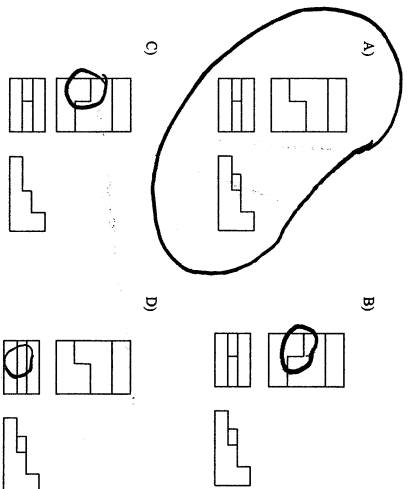
13. An empty box is illustrated below.



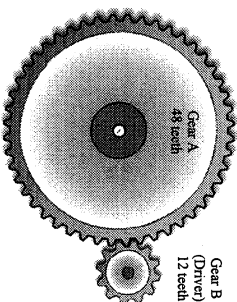
14. An object is illustrated below.



Which multiview orthogonal projection corresponds to this object?



15. The diagram below shows a motion transmission system consisting of three gears. Gear B is the driver.



Which of the following indicates the speed ratio between gears A and B and the number of teeth gear C should have so that its speed ratio is  $1/3$ ?

- A) The speed ratio between gears A and B is 0.25, and gear C should have 4 teeth.
- B) The speed ratio between gears A and B is 0.25, and gear C should have 36 teeth.
- C) The speed ratio between gears A and B is 4, and gear C should have 4 teeth.
- D) The speed ratio between gears A and B is 4, and gear C should have 36 teeth.

$$\frac{\text{Driver}}{\text{Driven}} = \frac{12}{48} = 0.25$$

$$\frac{1}{3} \text{ speed} = 3x \text{ bigger}$$

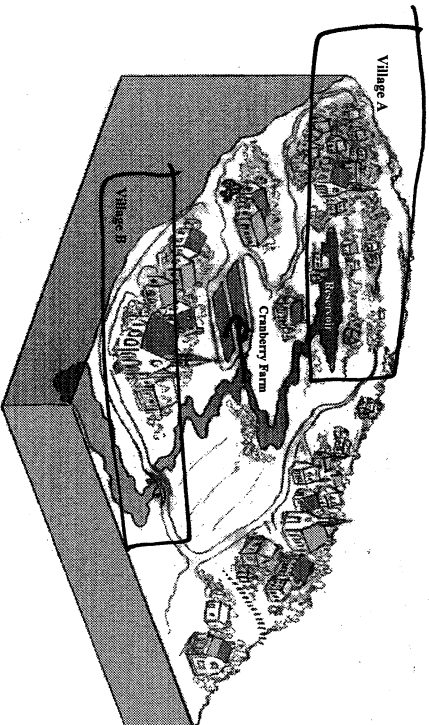
$$12 \times 3 = 36$$

**PART B**  
CONSTRUCTED-RESPONSE QUESTIONS

**INSTRUCTIONS**

ANSWER QUESTIONS 16 TO 19 IN YOUR ANSWER BOOKLET, SHOWING ALL YOUR WORK.

16. A farmer wants to grow cranberries, and this will require large amounts of water.

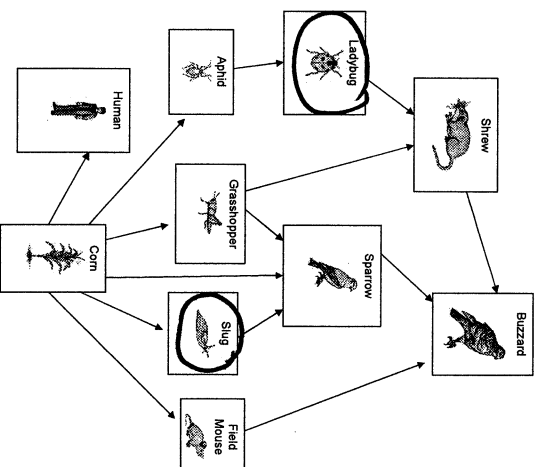


Village A gets its water from the reservoir, while village B gets its water directly from the river, as shown in the diagram above.

According to the diagram, will the removal of the water required for the cranberry farm have the same impact on villages A and B? Explain your answer.

*A will not be affected b/c up river gets H<sub>2</sub>O from reservoir. B will be the river will have less water*

17. The following diagram shows the food web of a corn field.



Which would have the greater impact on the food web of the corn field: the extinction of ladybugs or the extinction of slugs? Explain your answer by comparing the impact of the extinction of each of these two animals.

*- lady bug will have a greater impact. They eat aphids, without the lady bug there will be more aphids. :: corn supply will diminish*

*- Birds can eat grasshoppers or corn instead. It is not a predator.*

18. By buying electrical appliances and products that use less energy, it is possible to lead a more ecological lifestyle.

Electrical appliances and products that meet certain standards qualify for the ECO-STAR label.

The following table indicates one of the standards that a television set must meet to qualify for the ECO-STAR label.

Table I – Maximum Power According to Screen Size

Screen Size (inches)	Maximum Power (W)
20	37
32	78
42	115

The following table lists three different models of television sets along with the energy they consume over different periods.

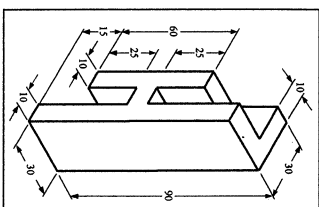
Table II – Energy Consumed by Different Models of Television Sets According to the Amount of Time They Are Used per Day

Model of Television Set	Screen Size (inches)	Energy Consumed When in Use (W·h)	Amount of Time Used per Day (h)
X	20	157	5.0
Y	32	255	3.0
Z	42	392	3.5

signé ✓  
112 W ✓

Which model or models qualify for the ECO-STAR label? Justify your answer by showing all your work.  
**X B Z meet the requirements.**

19. In your answer booklet, complete the three views of the multiview orthogonal projection of the object illustrated below.

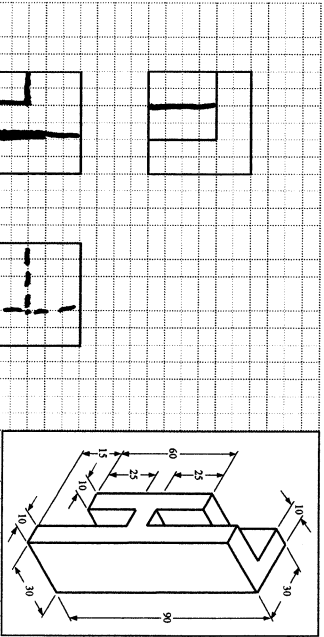


18. Which model or models qualify for the ECO-STAR label? Justify your answer by showing all your work.

Blank lined area for student response to question 18.

4 3 2 1 0

19. Complete the three views of the multiview orthogonal projection of the object illustrated below.



Scale: = 10mm

4 3 2 1 0