**IB Newton’s Laws Practice**

(Answers are at the end of the documents….but don’t look until you have tried the questions first!)

**1.** A horse pulls a boat along a canal at constant speed in a straight-line as shown below.



 The horse exerts a constant force *F* on the boat. The water exerts a constant drag force *L* and a constant force *P* on the boat. The directions of *F*, *L* and *P* are as shown. Which **one** of the following best represents a free-body diagram for the boat?



(1)

**2.** A block of mass *m* is pulled along a horizontal, frictionless surface by a force of magnitude *F*. The force makes an angle ** with the vertical.



 The magnitude of the acceleration of the block in the horizontal direction produced by the force *F* is

A. 

B. 

C. 

D. 

(1)

**3.** Three forces of magnitude *F*1 = 3.0 N, *F*2 = 4.0 N and *F*3 = 6.0 N act at a point. The point is in equilibrium. The magnitude of the resultant of *F*1 and *F*2 is

A. 1.0 N.

B. 5.0 N.

C. 6.0 N.

D. 7.0 N.

(1)

**4.** A body of weight 2*W* hangs vertically from a string attached to a body of weight *W*. Weight *W* is released and both bodies fall vertically.



Air resistance may be neglected. What is the tension in the string during the fall?

A. Zero B. *W* C. 2*W* D. 3*W*

(1)

**5.** Block on an inclined plane

A block is held stationary on a frictionless inclined plane by means of a string as shown below.



(i) On the diagram draw arrows to represent the three forces acting on the block.

(3)

(ii) The angle ** of inclination of the plane is 25. The block has mass 2.6 kg. Calculate the force in the string. You may assume that *g* = 9.8 m s–2.

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(2)

**6.** A truck collides head on with a less massive car moving in the opposite direction to the truck. During the collision, the average force exerted by the truck on the car is *F*T and the average force exerted by the car on the truck is *F*C. Which **one** of the following statements is correct?

A. *F*T will always be greater in magnitude than *F*C.

B. *F*T will always be equal in magnitude to *F*C.

C. *F*T will be greater in magnitude than *F*C only when the speed of the car is less than the speed of the truck.

D. *F*T will be equal in magnitude to *F*C only when the speed of the truck is equal to the speed of the car.

(1)

**7.** A small boat in still water is given an initial horizontal push to get it moving. The boat gradually slows down. Which of the following statements is true for the forces acting on the boat as it slows down?

A. There is a forward force that diminishes with time.

B. There is a backward force that diminishes with time.

C. There is a forward force and a backward force both of which diminish with time.

D. There is a forward force and a backward force that are always equal and opposite.

(1)

**8.** Mandy stands on a weighing scale inside a lift (elevator) that accelerates vertically upwards as shown in the diagram below. The forces on Mandy are her weight W and the reaction force from the scale *R*.



The reading of the scale is

A. *R* + *W*.

B. *W*.

C. *R*.

D. *R* – *W*.

(1)

 [1]

Answers

**1.** B

**2.** B

**3.** C

**4.** A

**5**. (i) *Award* ***[2]*** *if all three directions are correct.*

 *Award* ***[1]*** *for showing that the weight arrow is longer than the*
*other two.* 3

(ii) taking components to find the component of the weight as *mg* sin**;

and hence tensions = *mg* sin** = 11N; 2

*Accept 3 s.f. as 10.8*

 **6.** B

**7.** B

**8.** C