Q16 [*Inclined planes*] A ship is released from rest at a launching ceremony on a slipway that is inclined at 8° to the horizontal. If the coefficients of static and sliding friction between the ship and the slipway are 0.20 and 0.15, respectively, and if any forces due to the water and the air can be neglected, what is the magnitude of the ship's acceleration? Choose from the key the option that is closest to your answer. Pencil across *one* cell in row 16.

KEY for Q16

A $0.1\ m\,s^{-2}$
B $0.6\ m\,s^{-2}$
C $1.4\ m\,s^{-2}$
D $3.4\ m\,s^{-2}$
E $9.6\ m\,s^{-2}$
F $9.8\ m\,s^{-2}$
G $0\ m\,s^{-2}$ because the slipway is not steep enough for the ship to slide.
H Impossible to answer without knowing the mass of the ship.

Q17 [*Projectiles*] A circus artist 'flies' from one trapeze to another, both at the same height above the ground and separated horizontally by 7.4 m. What is the minimum speed with which the circus artist can leave the first trapeze in order to reach the second trapeze? Choose from the key the option that is closest to your answer. Pencil across *one* cell in row 17.

KEY for Q17

A $2.3\ m\,s^{-1}$
B $4.9\ m\,s^{-1}$
C $6.0\ m\,s^{-1}$
D $7.2\ m\,s^{-1}$
E $8.5\ m\,s^{-1}$
F $9.8\ m\,s^{-1}$
G $12.0\ m\,s^{-1}$
H $19.6\ m\,s^{-1}$

Q18 [*Uniform circular motion*] If the Earth were to spin much more rapidly on its axis, it would disintegrate. For example, a stone placed on the ground at the equator would not remain at rest relative to the underlying ground, because the inward force provided by gravity would be unable to maintain the required daily uniform circular motion. Calculate the critical period of spin of the Earth that marks the borderline between stability and instability for an object resting on the ground at the equator. Choose from the key the option that is closest to your answer. The radius of the Earth is 6.38×10^6 m. [*Hint. The total force on an object at rest on the Earth's surface is due to the combined effect of the inward gravitational force and the outward reaction force. If the speed of rotation of the Earth were increased, gravity would remain the same but the reaction force would decrease. Instability occurs when the reaction force disappears.*] Pencil across *one* cell in row 18.

KEY for Q18

A 3 minutes
B 15 minutes
C 55 minutes
D 85 minutes
E 135 minutes
F 340 minutes
G 1440 minutes